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EXPERIMENT STATION RECORD

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Once again adhering to the time-honored custom of a meeting in Washington in alternate years, the forty-second annual convention of the Association of Land-Grant Colleges and Universities was held in this city from November 20 to 22, 1928. The period which had elapsed since the 1927 convention had been one of tranquillity as regards most of the association's interests, and no outstanding issues awaited determination. None the less the registration is believed to have exceeded that of any other convention, interest was active and well sustained, and the opinion was widely expressed that in many ways the meetings were unusually profitable and productive.

Most of the usual helpful contacts characteristic of a gathering in the Nation's Capital were again available. The association was received at the White House by President Coolidge, and the greetings of the Departments of Agriculture and Interior were extended by their respective heads. Opportunity was also afforded for more intimate relations with the Bureau of Education, the War Department, the Federal Radio Commission, the various bureaus and offices of the Department of Agriculture, and other agencies, and informal conferences on a regional, institutional, or individual basis took place during the week to an extent as significant as it was encouraging.

Not only was the attendance larger than ever before but it was notably representative. Delegates were present from every State, as well as the Territory of Alaksa, and in many instances the delegations included a complete complement of the president, the deans of agriculture and engineering, the directors of research and extension, and the head of home economics activities, and in not a few cases other members of the staff. Somewhat more than half of the chief executives of the institutions were registered, but there were about 40 extension directors, and the only experiment stations unrepresented were those of Alabama, Florida, Montana, and Oregon.

The number of auxiliary societies and other groups meeting during the week was somewhat larger than for several years. The American Association for the Advancement of Agricultural Teaching was in session on the preceding day, holding one meeting jointly with the subsection of resident teaching, and the American Association of Soil Survey Workers met on November 21 and 22. Later in the week came the American Society of Agronomy and the National Association of State Universities, each of whose sessions overlapped those of the land-grant colleges on the latter's final day.

Another organization which met in Washington throughout the convention period was the National Grange. Arrangements were made whereby this body attended one of the general sessions of the association, and the national master, Mr. L. J. Taber, delivered one of the principal addresses. The somewhat remarkable fact was brought out that this was the first opportunity that had ever been presented for a joint meeting of these two bodies, both long and intimately concerned with the advancement of agriculture and the betterment of country life, and deep gratification was expressed that they had at last been brought together formally in this way. Actually, of course, contacts had long since been established at many points. Traditionally the Grange has been widely recognized as one of the important factors in the upbuilding of the agricultural colleges and experiment stations, and especially in the drawing of these institutions into close touch with farm life and farm people. None the less the session symbolized in a distinctive and impressive way the many interests and ideals which the Grange and the association have had and must continue to have in common.

The arrangement of the association program followed the general plan of recent years with the exception of an important change as to the section on agriculture. Under this change, requested by the section in 1927, each of the divisions of resident teaching, experiment station work, and extension work was allotted two half-day sessions instead of one as formerly, while the section as a whole held two sessions instead of three. As was anticipated the new plan materially relieved the congestion in the subsectional programs and gave opportunity for more extended discussion. The curtailed section program scheduled six papers, of which two dealt directly with research, two with matters of chief interest from the standpoint of extension work, and the remainder were of more general appeal. Discussion of instruction problems was thereby restricted to the subsection of resident teaching, where ample time was available but only when experiment station and extension matters were being considered by their respective subsections. This paralleling of programs presumably caused increased embarrassment for the numerous deans who are also directors of research or extension, but on the whole the new plan seemed to meet with general approbation.

The tendency in recent years to confine the general sessions of the association more and more closely to addresses was again discernible. For the first time the presentation of the report of the committee on instruction in agriculture, home economics, and mechanic arts was transferred from the general sessions to the executive body, which met as usual behind closed doors. Likewise no announcement was made in the general sessions as to the committee appointments or of the results of the elections of section and subsection officers. While very likely without special significance, the practical result of these changes in procedure was to widen the gulf already existing between members of the executive body and all others in attendance as to an early and direct knowledge of numerous details of the association's business which were of considerable interest. On the other hand, an attempt was made to disseminate through the press more adequate reports of the various papers by the securing in advance of brief abstracts. These abstracts were not forthcoming from all of the speakers, but many were available and the plan seemed to have possibilities as an aid to wider publicity for the association and its work.

The general theme of the convention was entitled How the Land-Grant Colleges and Universities Have Found Themselves. The contribution to this theme by the president, Dean J. L. Hills of Vermont, took the form of an address entitled The Builders of the Association. In this address Dean Hills paid tribute in impressive and felicitous fashion to the five workers in the association whom he deemed outstanding in their leadership during the early days—Presidents Henry E. Alvord of Maryland, George W. Atherton of Pennsylvania, H. H. Goodell of Massachusetts, and Henry C. White of Georgia, and Dr. W. O. Atwater, founder of the first State-aided experiment station and of the Office of Experiment Stations.

Further acknowledgments of the indebtedness of the land-grant institutions to the past were presented by other speakers, including former Director W. H. Jordan of New York, Dean H. L. Russell of Wisconsin, and Presidents F. L. McVey of Kentucky, F. D. Farrell of Kansas, and A. M. Soule of Georgia. Of these, Doctor Jordan graphically depicted the pioneer conditions under which the experiment stations began their work, and warmly commended the spirit of resourcefulness and initiative which these conditions engendered and developed. Dean Russell found the distinctive contributions of the land-grant colleges to lie in their upbuilding of a symmetrical and unified system of resident teaching, experimentation, and extension, and in their dignifying of applied science. President McVey drew attention to their accomplishments in the development of advanced work in science and economics and in their contributions to better living. President Farrell characterized his conception under the title The Introduction of a New Ideal, attributing to these institutions great service to a democracy in breaking down the oriental idea of a leisure class educated and trained for leadership and superimposed upon the masses carrying on the manual work of the world. In the view of President Soule, the agricultural colleges had elevated agriculture from the status of manual operations to a true profession, and had also done much to stimulate industry and to advance human welfare in general through their studies in health and nutrition and in other ways.

Another contribution to the program of reminiscence and retrospect was made in the report of the bibliographer. In this report Dr. A. C. True presented brief accounts of 29 scientific and technical societies in whose organization and upbuilding the workers in the land-grant institutions and the United States Department of Agriculture had had a prominent part. These societies, beginning with the Society for the Promotion of Agricultural Science in 1880, were shown to have covered very completely the subjects of agriculture and home economics and to have rendered a unique and important service, which, except in the case of the single general society much of whose field is now occupied by Section O of the American Association for the Advancement of Science, has continued without interruption since their formation.

In a paper given before the extension division under the title of The Influence to Date of Smith-Lever Extension Work on Rural Life, Dr. C. B. Smith reviewed the specific accomplishments in this direction. Among other things he showed that there were 58,000 rural communities in 1927 that "went through the process, in cooperation with extension forces, of critically analyzing their farm and home problems, reaching a decision as to what they would do about them. There were 243,000 men and women, who, upon the solicitation of extension forces, stepped out from these groups and volunteered to prepare themselves to help themselves and their neighbors carry out the program of individual, local, community, and county improvement they mutually had agreed upon. On 772,000 farms in these communities the farmer or his wife, at the instigation of extension forces, put on a demonstration to show the better way, while at the same time 776,000 more demonstrations were put on by the children of the farmers to show the better way. Here is a total of more than 1,500,000 demonstrations of better methods of doing things in a single year, and cooperative extension has been going on 15 years and is cumulative in its effects."

As a whole, he concluded, "extension is profoundly influencing rural life, because it is profoundly influencing rural men and women and teaching them to study, to analyze, to resolve, and to do."

Somewhat similar in aim was the address given by Dr. Louise Stanley entitled Contributions to Rural Life by Home Economics. The outstanding disadvantages confronting farm women were declared to be their lack of distinctive training for country life, the traditional narrowness of such life, and the absence of supervision of public health in many rural districts. Many specific instances were cited by Doctor Stanley to illustrate how the home economics workers of the Nation have helped and are helping in the solution of these and other country life problems.

Another group of addresses of broad interest dealt with the present economic status of agriculture and its relations with other industries. The agricultural situation itself was discussed by Dr. A. F. Woods, Director of Scientific Work. Speaking as the representative of the Department of Agriculture, Doctor Woods warmly commended the report of the association's special committee on the subject as submitted to the Chicago meeting in 1927, and described some of the steps which the Department, as well as the land-grant institutions, are taking to aid in the carrying out of the committee's recommendations. In his opinion, "American agriculture is rapidly emerging from its haphazard methods and unorganized state into organized commodity groups. It has available trained leadership in all branches of its work. It is improving its fact-finding and educational agencies. It is demanding and securing legislation that places it on an equality with other industries. It offers an increasing attraction to young men and women who like its freedom and its challenge and its broad opportunities of worth-while service. It promises increasing financial reward and stability. It responds to the best thought and the best effort. It offers the opportunity to make the ideal home, from which shall come not only those who will 'carry on' in the country, but, as it has in the past, also those who will carry these ideals into the life of the city and help maintain that mutual understanding and unselfish cooperation upon which the welfare of our Nation must rest."

The address of the master of the National Grange, already referred to, likewise dealt largely with the agricultural situation and especially in its bearings upon his subject, Training for Leadership. In Mr. Taber's view, it is the combination of brains with brawn that will ultimately solve the farm problem. Production phases, he believed, are already well in hand, but there has not as yet been proportionate emphasis on either the economic aspects of the farm business or of the effectiveness of strong farm organizations. Conceding the invaluable assistance rendered by the graduates of land-grant institutions, he maintained that their responsibilities as citizens have not yet been fully discharged, and that any tendency to seek and rest content with mere individual success should give way to a broader altruism and a constructive leadership looking toward the advancement of country life as a whole.

Much the same general conclusion was reached by Dr. N. A. Olsen, Chief of the Bureau of Agricultural Economics, in a discussion of economic information in the bureau available for extension work. Pointing out that economic advice can not be reduced to formulas or set facts that can be driven home by reiteration, since economic facts are constantly changing, and that farmers must be taught to comprehend and understand the economic situation at a given time and then helped to reason out for themselves their best course of action, Doctor Ilsen went on to say that "successful agriculture will not be built on individual effort alone. Collective action, whether among farmers themselves or through the medium of government, will have a vital bearing on the industry. These past several years have demonstrated as never before that farmers are a vital part of the body politic. Their interests are deeply influenced by the conditions which affect the Nation as a whole and by public policies such as those that aim to increase farm lands through irrigation, and policies in regard to tariff. To what extent are farm lands bearing an undue portion of the tax burden? What can farmers do to help to adjust tax inequalities? How can they and we direct forces that go to help assure farmers an equal opportunity with other groups and help to secure for them a fair share of the national income? Farmers of this country must learn to think deeply and soundly on all these matters and to take their full share in shaping national and State policies if we are to maintain and increase the prosperity of our rural people."

The futility of relying upon either cooperation or legislation alone as a panacea for all agricultural ills was effectively set forth by President J. L. Coulter of North Dakota in an address entitled Organized Labor and Capital and Unorganized Agriculture. President Coulter attributed much of the improved economic status of labor and capital to causes which have accompanied collective efforts, such as restriction of immigration, tariff protection, and the discovery of vast natural resources. He also differentiated sharply between remedies suitable for low prices due to crop variations in easily stored and transportable products such as wheat and relatively perishable and nontransportable crops like potatoes, pointing out that widely different steps would be necessary to bring about improvement in the two situations.

The extreme complexity and close interrelationships of modern civilized life formed the theme of a stimulating address by Mr. Merle Thorpe, editor of the *Nation's Business*. Because of this mutual interdependence, Mr. Thorpe vigorously combated the claim that business interests are antagonistic to agriculture or unsympathetic with its needs. He also deprecated the tendency of many groups to look to Federal legislation as a cure-all for economic and social ills, declaring that as a rule such conditions are too complicated for effective solution by lawmakers alone and that the administrative machinery in operation for the enforcement of existing statutes has so increased that the equivalent of one day's work each week is now required to pay taxes. The real remedy, in his opinion, seems to lie with the various groups themselves, but he commended publicly supported research, especially along economic lines, as a necessary preliminary to sound and effective group action.

The policy which the land-grant colleges should pursue in cases of seeming conflict between agriculture and business interests was set forth in a discussion by Dean E. D. Merrill of California entitled Cooperation with Marketing Associations. As public institutions, the colleges, in Dean Merrill's opinion, must be educational and not promotional. Farmers should not be advised to join specific organizations nor should the college staffs be identified with their active management. On the other hand, the experiment stations should study marketing, distribution, and other economic problems with the same freedom as those of production, and the colleges of agriculture should train students and carry on extension work as to the merits and difficulties of cooperation, as well as of other distinctive systems.

Still further expression of the keen interest in the economic phase was given by the subsection on extension work, which devoted one of its two sessions mainly to this question. The economic information in the Bureau of Agricultural Economics available for extension was discussed in general by the chief of that bureau, and as regards pork production, wheat marketing, and apple growing by three other members of the bureau staff, Dr. M. Ezekiel, Dr. O. C. Stine, and Mr. H. R. Tolley, respectively. Successful methods of extending to farmers the economic information developed by the bureau and the experiment stations were considered by Extension Directors B. W. Ellis of Connecticut, C. E. Ladd of New York, and J. C. Taylor of Montana. It is evident that, as in research, extension work in agricultural economics has brought many new problems as to method and treatment, but that widespread efforts are being made to attack them as rapidly and as comprehensively as their novelty and admitted complexity will permit.

The interests of agricultural research received more consideration in the convention than for several years. The responsibilities of the director's office, the scope and limitations of interinstitutional cooperation, the outlook for fundamental research, and the opportunities for effective progress in some of the newer fields of inquiry were among the topics to receive attention. Detailed discussion of these and related matters is reserved for the February issue of the *Record*.

The subsection of resident teaching busied itself largely with such topics as student enrollment and elimination, the special field of non-degree courses, and the development and maintenance of standards of instruction. One of the principal contributions on the last-named topic was made in the report of the committee on instruction in agriculture, home economics, and mechanic arts, presented only in summary form before the executive body by the chairman of the committee, Dr. A. C. True. This report continued the studies instituted previously in cooperation with the department of educational psychology of George Washington University on methods of measuring teaching efficiency. Data have now been obtained from a total of 28 land-grant institutions, using tests given to 6,637 students in general chemistry at the end of their freshman year to determine the progress actually made as influenced by such factors as the professional training, rank, and experience of the teachers and their teaching load. But little effect was discernible as regards the degree or rank of the instructors, but the highest teaching efficiency was indicated during the first 10 or 12 years of service. Specific conclusions were again withheld by the committee, which deemed further studies necessary and particularly their extension to other subjects closely related to agriculture, home economics, and engineering.

In recent years it has become customary in the section on agriculture to include an address dealing with insect or plant disease control. This address was assigned to Dr. C. L. Marlatt, Chief of the Bureau of Entomology, whose topic was Problems and Policies Relating to the Control of the Spread of Recently Introduced Insects and of the Injury Caused by Them. Doctor Marlatt reviewed the conditions prevailing in this country prior to the enactment of the Federal plant quarantine act of 1912 and some of the results of quarantine enforcement, particularly as related to interstate problems and possibilities.

Aside from the usual committee reports, the section of home economics again gave its major attention to matters related primarily to instruction, the phase which still seems to be its immediate interest and concern. The program of the section on engineering likewise followed along accustomed lines, with the important innovation of a paper and discussion on agricultural engineering in the land-grant institutions. This topic was introduced by Dean R. A. Seaton of Kansas, who pointed out that, although the number of agricultural engineering students represents only a small percentage of the total engineering enrollment in these institutions, 17 States are now giving degree courses in the subject, and it is one of large economic interest.

Research in agricultural engineering, it was brought out, utilized a little over $250,000 in 1927, or about one-fifth as much as was available to the engineering experiment stations for all purposes. In the ensuing discussion, participated in by Deans A. Marston of Iowa, O. J. Ferguson of Nebraska, and A. A. Potter of Indiana, the question of the administration of agricultural engineering work was taken up, the consensus of opinion in the section favoring a joint administration by the divisions of engineering and agriculture.

More light on this and on many other more or less puzzling problems will doubtless eventually be forthcoming from the land-grant college survey. This survey has been actively prosecuted during the past year, and an interim report by Dr. L. A. Klein, of the United States Bureau of Education, was received with much interest. According to this report, material progress has been made in the completion and return by the several institutions of the extensive questionnaires which have been distributed by the bureau, and the project is rapidly reaching the stage where the results can be tabulated and made available for discussion and recommendation.

At the final session of the executive body, the vice president of the association, Dean Anson Marston of Iowa, was elected president. Dean J. G. Lipman of New Jersey was chosen vice president, and the vacancy on the executive committee arising in consequence was filled by the selection of Dean F. E. Turneaure of Wisconsin. Deans C. A. McCue of Delaware and J. L. Hills of Vermont, who had been serving, respectively, as secretary-treasurer and assistant treasurer by appointment from the executive committee, were elected to these positions. A complete list of the section and subsection officers and of the numerous changes in committee assignments is given on page 100 of this issue. A standing committee on aeronautics was also authorized.

Taken as a whole, the 1928 convention was an interesting and profitable gathering. Few urgent matters of outstanding importance were clamoring for disposal and more time than usual was devoted to retrospect and reminiscence, but ample opportunity was afforded for the consideration of current problems, and the attitude of the association was as unmistakably forwardlooking and progressive as at any period of its history. The program, particularly in the general sessions, was of high quality and broad appeal. The attendance was well sustained and appreciative, and a spirit of harmony and good will prevailed throughout the meetings. All these factors, and many others as well, indicated anew that not only have the land-grant colleges found themselves, as asserted in the convention theme, but that they are equally resolved to press on and utilize to the maximum of their resources their unique opportunity.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The story of chemistry, F. L. DARROW (*Indianapolis: Bobbs-Merrill Co., 1927, pp. [10]+528, pls. 32, figs. 30*).—The purpose of this book, as stated in the author's preface, is to present "in thoroughly popular form the salient features of a science fundamental to the highest welfare of all nations both in peace and war."

Its contents are as follows: The alchemist; after the alchemist; atoms, electrons, and protons; chemistry and power; a glance at gases; agriculture and war; chemistry and disease; rubber, yesterday and to-morrow, the twilight realm of matter; the age of metals; in the realm of synthetics; American progress in chemistry; chemistry in the day's work; and research the key to future progress.

Annual reports on the progress of chemistry for 1927, edited by C. SMITH (*Ann. Rpts. Prog. Chem.* [*Chem. Soc., London*], *24* (*1927*), *pp. X+11-367, figs. 3*).—This is the usual annual review (E. S. R., 57, p. 201).

Fixation of atmospheric nitrogen, F. A. ERNST (*New York: D. Van Nostrand Co., 1928, pp. IX+154, pl. 1, figs. 17*).—"This book is not . . . intended for the scientist or technician familiar with the subject of the fixation of atmospheric nitrogen, but is intended for the technical man of other walks of life, for the teacher and student, for the business man and the banker."

The contents are as follows: Nitrogen, atmospheric nitrogen fixation, the arc process, the cyanamide process, the direct synthetic ammonia process, economic considerations, ammonia conversion products, statistics, and appendixes.

New high-temperature fixation reactions of nitrogen, N. W. KRASE and B. MACKEY (*Jour. Phys. Chem., 32 (1928), No. 10, pp. 1488-1494, fig. 1*).—A discussion of several new high temperature nitrogen fixation reactions on the basis of thermodynamic theory is presented in this contribution from the University of Illinois, bringing out the following among other points of interest:

In the case of nitrogen and oxygen only a comparatively small increase in the obtainable concentration of nitric oxide results from the use of stoichiometric proportions of nitrogen and oxygen instead of air, but the reaction of nitrogen and carbon dioxide in the arc should yield a concentration more than double that obtainable in the treatment of air. "Three reactions of nitrogen yielding hydrocyanic acid appear to be promising. Nitrogen, hydrogen, and carbon should yield concentrations of hydrocyanic acid exceeding 15 per cent at the usual arc furnace temperature. The interaction of nitrogen and methane to form hydrocyanic acid and hydrogen is complete at 2000° Absolute. The combination of nitrogen and acetylene to form hydrocyanic acid is quite marked at relatively low temperatures, and should yield a gas containing almost 70 per cent hydrocyanic acid by volume at the arc furnace temperature."

Studies of tomato quality.—II, Effect of soil moisture upon the percentage of dry matter in the fruit, R. E. BROOKS and J. H. MACGILLIVRAY (*Jour.*

Assoc. Off. Agr. Chem., 11 (1928), No. 3, pp. 389–393, fig. 1).—The percentage of moisture in tomato fruit was found to vary with the percentage of moisture in the soil, 70 per cent of soil moisture producing the largest quantity, as well as the largest number and size, of fruit. It is noted that "the percentage of dry matter in tomatoes greatly affects the cost per unit of food purchased on a weight or volume basis."

The report is a communication from the Indiana Experiment Station covering a study of tomatoes grown under conditions of 30, 50, and 70 per cent soil moisture. Previous work has already been noted (E. S. R., 58, p. 231).

Avocado oil, G. S. Jamieson, W. F. Baughman, and R. M. Hann (*Oil and Fat Indus., 5 (1928), No. 7, pp. 202–206*).—Attempts to express oil from the fresh fleshy portion of the avocado fruit resulted only in a stable emulsion of oil and juice, but from the dried pulp the authors of this contribution from the U. S. D. A. Bureau of Chemistry and Soils were able to obtain an oil, dark green by transmitted and red by reflected light, the expressed oil being lighter in color than the ether-extracted product and possessing but a slight odor together with a pleasant fruity flavor, so that it "probably could be used as a commercial edible oil if it were not for its color." A sample refined by the caustic soda process and bleached with 6 per cent of fuller's earth had a color considerably lighter but still of too dark a green to permit the use of the product as a commercial edible oil. It is considered that the oil could be obtained from the dried pulp of cull fruit in quantity and quality to make it usable in combination with other fats for the manufacture of hard soap, the dried pulp having an oil content of about 70 per cent. A boiled settled soap made from the crude oil was moderately hard, had a pale green color, but became bleached on the surface to a cream color after three or four days' exposure to the sunlight. The keeping qualities of the oil were found to be good.

The chemical examination of this oil as obtained by ether extraction from the dried pulp showed it to contain glycerides of oleic acid 77.3 per cent, linolic acid 10.8 per cent, myristic acid a trace, palmitic acid 6.9 per cent, stearic acid 0.6 per cent, and arachidic acid a trace, together with unsaponifiable matter 1.6 per cent. The specific gravity of a sample was 0.9132 (25°/25°), refractive index 1.4700 (20°), acid value 2.8, saponification value 192.6, unsaponifiable matter 1.6 per cent, iodine number (Hanus) 94.4, acetyl value 9.2, Reichert-Meissl number 1.7, Polenske number 0.2, saturated acids (corrected) 7.2 per cent, unsaturated acids (corrected) 84.3 per cent, and iodine number of unsaturated acids 101.2.

The interrelation of hydrogen-ion activity and concentration of salt in the activation of pancreatic amylase, H. C. Sherman, M. L. Caldwell, and M. Adams (*Jour. Amer. Chem. Soc., 50 (1928), No. 9, pp. 2529–2535, figs. 2*).—The optimal active hydrogen-ion concentration for pancreatic amylase in the presence of various concentrations of sodium chloride, potassium chloride, and sodium bromide, fluoride, nitrate, chlorate, thiocyanate, and sulfate was determined. The optimum was found dependent upon both the nature and the concentration of the salt present, decreasing, in the case of all the salts here reported upon, with increasing salt concentration up to a limiting concentration beyond which no further change was noted. The limiting concentration depended upon the salt used, sodium sulfate and phosphate being found without influence upon the activity of pancreatic amylase.

The influence of concentration of neutral salt on the activation of pancreatic amylase, H. C. Sherman, M. L. Caldwell, and M. Adams (*Jour. Amer. Chem. Soc., 50 (1928), No. 9, pp. 2535–2537, fig. 1*).—The concentrations of sodium and potassium chloride and of sodium bromide, nitrate, chlorate, thiocyanate, and fluoride optimum in each case for the activation of pancreatic amylase were found to differ according to the salt used, the activity of the enzyme appearing to be favored by more acid solutions in the presence of those salts of which higher concentrations were required for the complete activation of the enzyme.

A quantitative comparison of the influence of neutral salts on the activity of pancreatic amylase, H. C. Sherman, M. L. Caldwell, and M. Adams (*Jour. Amer. Chem. Soc., 50* (*1928*), *No. 9*, *pp. 2538–2543*).—Comparison was made of the influence of sodium, potassium, and lithium chlorides and of the bromide, fluoride, nitrate, chlorate, thiocyanate, and sulfate of sodium upon pancreatic amylase activity on the basis of quantitative determinations. The salts less favorable to the activity of pancreatic amylase were required in higher concentrations, and in turn exerted their most favorable influence in solutions of a hydrogen-ion activity higher than that optimal for those salts found more efficient as activators. Amylolytic activity in the presence of two anions each of which had a specific influence was found intermediate between the activities noted in the presence of each anion acting separately and was dependent upon the relative concentrations of the two anions. Reduction of the enzyme concentration by one-half or the use of a 4 per cent instead of a 2 per cent starch solution did not appreciably influence either the concentration of sodium chloride necessary for the complete activation of the enzyme or the optimal hydrogen-ion activity. The anions appeared to have far more influence than the cations, although the latter seemed to have a slight effect.

The chloride was found the most effective of the ions studied, the remaining salts in order of their activating capacity in the hydrolysis of starch by pancreatic amylase being given as follows: Sodium, potassium, and lithium chlorides, sodium bromide, sodium nitrate, sodium chlorate, sodium thiocyanate, and sodium fluoride. Sodium sulfate and phosphate were without influence on the activity of pancreatic amylase. The possible explanations of these effects are discussed in some detail.

A study of the cause of honey fermentation, F. W. Fabian and R. I. Quinet (*Michigan Sta. Tech. Bul. 92* (*1928*), *pp. 41*, *figs. 20*).—A medium was prepared by mixing 1 part of honey with 2 parts of 3 per cent nutrient agar and adjusting the pH value of from 6.8 to 7.0, after which the medium was tubed and sterilized in the usual manner. The tubes were seeded in the usual way at 45 to 50° C., plated, and incubated at room temperature. With a lower percentage of honey in the medium (10 per cent), bacteria and molds constituted the predominant microflora, but with a honey concentration of about 30 per cent yeasts predominated and no bacteria were demonstrated. Molds grew on almost all concentrations of honey agar.

It was found that honey can absorb, under favorable conditions, sufficient moisture for fermentation, a minimum of nearly 26 per cent and a maximum of approximately 33 per cent absorption having been observed at 20° C., while the moisture content minimal for fermentation appeared to be in most cases approximately 21 per cent.

As a theory explaining the fermentation of sugar solutions of a concentration as high as those constituting honey, the view is offered that the hygroscopic nature of honey results in a surface dilution sufficient to permit the growth of certain yeasts, which then become accustomed to increasing sugar concentrations and eventually are able to grow throughout the honey.

A second part of the bulletin is concerned with the yeasts isolable from fermenting honeys, and presents the results of a morphological, physiological, and cultural investigation of 25 yeasts capable of alcoholic fermentation of honey. The yeasts isolated were assigned to the genera Zygosaccharomyces and Torula, one apparently new form of each of these genera having been found and designated *Z. mellis* n. sp. and *T. mellis* n. sp., respectively.

Drawings of many of the forms isolated are shown.

Detergent experiments on cotton, R. M. Chapin (*Oil and Fat Indus., 5 (1928), No. 7, pp. 208–212, figs. 9*).—Continuing an investigation of detergents, in which the removal of oil-free soiling material has already been studied (E. S. R., 58, p. 716), the author now reports experiments on the cleaning with various soaps of cotton fabrics soiled by means of ointments of lamp black with vaseline, lard, and medicinal mineral oil. After the soiled fabric had been washed in a machine described by the author in an earlier report (E. S. R., 54, p. 806), the residual soil was determined by means of a colorimeter arranged as a reflectometer. Pure sodium laurate, myristate, palmitate, stearate, and oleate were the soaps used, the last-named showing the most powerful detergent effect up to a temperature of 40° C. At 60° the palmitate took first place, however, and at 80° the stearate became the most effective. The addition of a sufficient quantity of an appropriate fat-solvent increased the detergent effect.

"In parallel with the writer's findings on emulsification, excess fatty acid enhanced detergent power while excess alkali decreased it." Other parallelisms between emulsification and detergency were found not distinct.

An electrically heated furnace for organic combustions, M. Phillips and R. Hellbach (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 3, pp. 393–396, figs. 2*).—It is noted that the ordinary electric combustion furnace of three heating units has the disadvantages (1) that the heating units are so wound as to become more heated at their centers than at the ends; (2) that no provision is made for the preheating of the oxygen or for the accurate temperature control of the front of the tube when lead peroxide is used in the analysis of nitrogenous compounds; and (3) that the same unit is used for heating the oxidized copper-gauze spiral and for the combustion of the substance, with the result of permitting the oxidized spiral to cool while the boat containing the sample is being heated.

Complete specifications for the construction of an electrically heated combustion furnace found to avoid all of the undesirable features enumerated are given. "The entire apparatus, including preheater, bubble-counter, and drying tube, is mounted on a board and thus makes one single and readily portable unit. As all the heating units are small, it is possible to use a smaller combustion tube and to make carbon and hydrogen determinations on 70 to 100 mg. samples, if so desired."

Five separate heating units are employed, that providing for the constant temperature of the lead peroxide consisting of a heating unit surrounding a hollow jacket fitted with a reflux condenser and designed to contain paracymene, while the remaining four units provide for the higher temperatures of the combustion region proper.

A table of carbon and hydrogen figures, found for samples of about 80 to 90 mg. of sucrose, paranitroaniline, and 2, 3-dichloroanthraquinone shows close agreement with the theoretical in the case of each of these substances.

An apparatus for obtaining measured areas of sprayed foliage for chemical analyses, J. M. Ginsberg (*Jour. Agr. Research [U. S.], 36 (1928), No. 12, pp. 1007–1009, fig. 1*).—An apparatus consisting essentially of a stamp or punch provided with two sets of dies 1.5 and 1.0 in. in diameter, respectively, and provided with an automatic counter, is described and illustrated in this contribution from the New Jersey Experiment Stations. The comparative results, in milligrams per gram of green foliage for entire leaves and for the circular cuttings produced by the new apparatus, of determinations of arsenic trioxide and of sulfuric anhydride are given.

"A comparison of the results secured from the two sets of samples does not reveal any appreciable differences between the quantities of arsenic or of sulfur found in the apple leaves. It appears therefore, that the apparatus herein described can be satisfactorily used in obtaining measured leaf areas for chemical analyses. By the aid of this apparatus the time and work required for planimeter measurements may be eliminated."

Diphenylcarbazide as a test for chromium, N. M. STOVER (*Jour. Amer. Chem. Soc., 50 (1928), No. 9, pp. 2363–2366*).—In a comparison of the new test with the ether-hydrogen peroxide test, it was found that with chromium originally in the form of the dichromate ion the ether-hydrogen peroxide method showed the presence of 1 part of chromium in 1,250,000, whereas by means of the diphenylcarbazide test 1 part of chromium could be detected in from 100,000,000 to 250,000,000 when the reaction was brought about in sulfuric acid solution. When chromium was originally present as the chromic ion (chromic nitrate), diphenylcarbazide gave, after conversion of the chromium to the chromate condition, a positive test with 1 part in 1,666,000, while a dilution of 1 part in 250,000 failed to show a positive reaction by the ether-hydrogen peroxide method.

The reagent consisted of 0.2 gm. of diphenylcarbazide dissolved in 10 cc. of glacial acetic acid and diluted to 100 cc. with 95 per cent alcohol.

Application to meat and meat food products of a rapid-boiling short-digestion method for the determination of protein, H. R. MCMILLIN (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 3, pp. 408–410*).—Shedd's short rapid boiling method (E. S. R., 58, p. 309) is reported by the meat-inspection laboratory of the U. S. D. A. Bureau of Animal Industry as having proved suitable, with some slight modifications, for the determination of nitrogen in meats and meat food products. For various meat products the method was successfully applied in the following form:

Place from 1 to 3 gm., according to the approximate nitrogen content of the sample, in a 800-cc. Kjeldahl flask with 0.7 gm. of mercuric oxide, 15 gm. of potassium sulfate, and add from 30 to 35 cc. of sulfuric acid. Place the flask on a Gilmer electric heater, previously fully heated, and continue the digestion for 10 minutes after complete clearing. Cool, add approximately 500 cc. of water, about 2 gm. of powdered talcum (to prevent bumping), and a mixture of 25 cc. of 4 per cent sodium sulfide (enneahydrate) with 60 cc. of sodium hydroxide solution of specific gravity approximately 1.45. Distill in the usual way (collecting approximately 200 cc.) into 0.5 N hydrochloric acid and titrate with standard 0.1 N sodium hydroxide, using 2 per cent paranitrophenol in 25 per cent alcohol as indicator.

Two tables of the results obtained in a comparison of the short digestion with the Gunning procedure indicate a close agreement of the figures for the two forms of the method. It is noted that the short digestion form saved from 1 to 3½ hours in the determination as compared with the official form.

[Silver] Benzoate test for olive oil (*Oil and Fat Indus., 5 (1928), No. 7, pp. 206, 207*).—Trials were made of the coin, the acetic anhydride, and the silver benzoate tests for sulfur residues in extracted olive oil prepared with carbon disulfide as solvent, with the following results: (1) With 100 per cent of extracted oil a shiny new dime was very definitely darkened, but in a mixture of 10 per cent of extracted and 90 per cent of expressed edible oil the coin was not blackened to an appreciable extent. (2) With 100 per cent of extracted oil, acetic anhydride gave a definite color reaction (rose red), and with 10 per cent of extracted and 90 per cent of edible oil a slight pink color. (3) Twenty mg. of dry silver benzoate (prepared by precipitation from silver nitrate with sodium benzoate in hot solution, the precipitate having been subsequently washed with cold water and dried), added to 5 cc. of a mixture of oils and heated to 150° C. in an oil bath, showed a dark brown coloration with 10 per cent of extracted oil, a coloration about one-half as deep with 5 per cent, and with 1 per cent of extracted oil mixed with 99 per cent of edible oil a definite brown coloration. It is considered an important point that the extracted oil had probably been refined (as indicated by its light color).

The silver benzoate test is recommended for adoption as a test for carbon disulfide extracted oil in expressed edible olive oil by the olive oil committee of the American Oil Chemists' Society, extracts from whose report are quoted in the present note.

The moisture content of oleomargarine, R. H. KERR (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 3, pp. 382–386*).—Samples of the oleomargarine produced by 37 establishments located in 18 cities distributed throughout the United States were collected, and the moisture content was determined. Results of examination of 159 samples representing 100 different brands show the moisture content of most of them to be above 8 and below 14 per cent. Examination of 45 samples representing 39 brands of oleomargarine intended to be used in cooking and baking indicates that the moisture content of this product is generally less than that of oleomargarine intended for general use as a butter substitute. Examination of 16 samples representing 15 brands of oleomargarine consisting of vegetable fats churned with skim milk shows a moisture content similar to that observed in oleomargarine consisting in part of the body fats of meat animals and intended for general use as butter substitutes.

Methods for the determination of milk solids in mixed feeds, A. B. DAVIS (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 3, pp. 410–417*).—The relative merits of nine suggested methods or bases for methods are considered, and results obtained in the application of some of these procedures are stated. A method based on lactose determination is considered the most accurate.

Determination of alcoholic extractive in gum benzoin, T. N. BENNETT and C. F. BICKFORD (*Jour. Assoc. Off. Agr. Chem., 11 (1928), No. 3, pp. 386–388*).—Including the Official method of the United States Pharmacopoeia, against which the objection is raised that drying the extractive at 110° C. causes the partial volatilization of a number of components, especially benzoic acid, six procedures were examined by the New York station of the U. S. Food, Drug, and Insecticide Administration. The following determination is recommended as simple, quick, and free from the more serious disadvantages found in the other methods considered:

Weigh 2 gm. of the sample into a dried and tared paper extraction thimble, using a glass-stoppered weighing bottle as a container. Extract continuously with a charge of 95 per cent alcohol containing about 0.5 gm. of sodium hydroxide for 5 hours. Dry and weigh the thimble and calculate the alcohol extractive matter plus water by difference. Deduct from this result the water content as determined by the xylol distillation and report the remainder as alcoholic extract.

METEOROLOGY

World weather, III, G. T. Walker and E. W. Bliss (*Mem. Roy. Met. Soc., 2 (1928), No. 17, pp. 97–134*).—This is a continuation of papers previously noted (E. S. R., 54, p. 208), presenting and discussing data for additional centers of action and indicating the value of the North Atlantic, North Pacific, and southern oscillations for seasonal forecasting. The discussion is by Walker and the tabulation by Bliss.

Walker states that, using data from these sources, it is possible to indicate "years in which a forecast can be issued with a chance of 4 : 1 in favor of correctness." He concludes that "the oscillations are not regarded as controlled by sunspot numbers, but as systematic swayings of interconnected world conditions which are slightly intensified or checked by solar conditions."

World weather, G. [T.] Walker (*Nature [London], 121 (1928), No. 3053, pp. 713–716, figs. 4; also in U. S. Mo. Weather Rev., 56 (1928), No. 5, pp. 167–170, figs. 4*).—From a study of the relationships of the great centers of pressure oscillation in the North Atlantic, North Pacific, South Pacific, and Indian Oceans to weather in other parts of the world, the author concludes that "although it may be some time before we learn the processes by which nature effects these enormous oscillations, and the relationships found must in general be regarded as empirical, there is no reason why they should not be utilized when possible for administrative or commercial purposes such as seasonal forecasting. Thus methods of predicting the general character of the winter and spring temperatures of a large part of northern Europe have been known for 20 years, and much additional knowledge has been won in recent researches. . . . The facts of the southern oscillation have been systematically utilized in predicting the rice crops of Japan, and the Java rainfall; and the recent tables have been shown by [E. W.] Bliss to have an immediate application to the Nile, the final relationship for forecasting being 0.72. The latest purpose to which they have been directed is in connection with Ceara, a State in northeast Brazil liable to terrible droughts, and, as rainfall there belongs to the second group in the southern oscillation, a formula with a coefficient of 0.82 follows at once."

The relationship of weather to crops in the plains region of Montana, P. Patton (*Montana Sta. Bul. 206 (1927), pp. 66, figs. 31*).—The relation of weather conditions to crop yields during the 40-year period, 1882–1921, particularly in the northwestern corner of the Great Plains region in Montana, is reviewed.

The normal precipitation at four places in this area is as follows: For the crop year, September 1 to August 31, inclusive, 13.51 in. at Havre, 13.0 in. at Miles City, and 14.08 in. at Williston, N. Dak.; for the growing season, April 1 to August 31, inclusive, 8.51 in. at Havre, 8.43 in. at Miles City, and 9.65 in. at Williston. It appears that "the normal crop-year and the growing-season precipitations are close to the limit for successful farming by the continuous-cropping system. . . . When a growing season's rainfall is 2.3 in. below normal, the crop yield will be small. Under such conditions it is obvious that attention must be given to cultural practices that store and conserve moisture in the soil. In this region it has been shown that summer fallowing part of the land each year is a necessary adjunct to successful farming when wheat is the major or sole crop." The early and seasonal rainfall is erratic. "A year of abundant rainfall may be followed by one of great deficiency, or the reverse, and with no apparent order."

As regards temperature, it is stated that "in general, extremely hot spells of long duration are the exception rather than the rule. It is not the duration of the hot spell so much as it is the combination of other weather elements occurring simultaneously that has a damaging influence on crops. As a rule, high temperatures in this area are accompanied by very low humidity, no rainfall, clear sky, and fair wind movement."

Taking "the average per cent of the 6 p. m. relative humidity during June and July . . . as the best-fitting single figure to represent the combination of all of the weather elements during the critical part of the major growing season," it was found that "89 per cent of the variation in crop yields may be said to be affected by the variations in the combination of the weather elements as expressed by [this] weather crop index."

Estimates of the probable yields of spring wheat on continuously cropped and summer fallowed land indicate much more favorable returns in the latter case. The fallowing of part of the land each year appears to be an insurance against drought. Corn raised for grain has not been a very certain crop during the period covered by this study. Rye has been a more certain grain crop than corn. Comparing rye hay and corn fodder, it is shown that in only 1 year of the 40 did both crops fail at the same time. Livestock raising has been favored by a fairly dependable grass supply over a long series of years. The system of carrying feed reserves from year to year has been found capable of tiding livestock over years of feed shortage in all but an exceptional year, like 1919. Good results have generally been obtained with the family garden. In many years it has produced a marketable surplus, and in all but a very few it has furnished the family with an ample supply of vegetables.

Growth of trees in the Forest of Dean in relation to rainfall (*Met. Mag. [London], 63 (1928), No. 746, pp. 29–33, fig. 1; also in U. S. Mo. Weather Rev., 56 (1928), No. 5, pp. 186, 187, fig. 1*).—From a study of measurements of the annual rings of trees, particularly yews, oaks, and beeches, made by E. G. Burtt in the Forest of Dean in an attempt to correlate tree growth with rainfall, it is concluded that the comparisons are not very convincing, and that it is doubtful whether the history of British rainfall can be written from the rings of trees, as has been done in western America.

Monthly Weather Review, [May–June, 1928] (*U. S. Mo. Weather Rev., 56 (1928), Nos. 5, pp. 167–206, pls. 10, figs. 15; 6, pp. 207–249, pls. 12, figs. 6*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for May and June, 1928, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 5.—World Weather (illus.), by G. [T.] Walker (reprint) (pp. 167–170) (see p. 16); Rainfall Maps of Cuba (illus.), by E. J. Foscue (pp. 170–173); A Meteorological Study of the Antarctic Region and the Atmospheric Circulation over the Extreme Southern Pacific Ocean, by J. B. Navarrete, trans. by W. W. Reed (pp. 174–176); The Source of the Water Vapor of the Atmosphere: A Criticism, by A. J. Henry (pp. 176, 177) (see p. 79); Some Relations between Evaporation, Precipitation, and Run-off (p. 177, 178) (see p. 79), and Precipitation, Evaporation, and Run-off (p. 178) (see p. 79), both by W. J. Humphreys; Solar Radiation in Middle North Germany According to Measurements at Potsdam, by J. Schubert, trans. and abs. by W. W. Reed (pp. 179, 180); The Root Problem of Macro-meteorology (illus.), by F. Baur (pp. 180–185); High Intensity of Solar Radiation in the Spring of 1928, by P. Gotz, trans. by W. W. Reed (pp. 185, 186); Growth of Trees in the Forest of Dean in Relation to Rainfall (illus.) (reprint) (pp. 186, 187) (see above); and Weather Bureau Staff Meetings, 1927 and 1928, by E. W. Woolard (p. 188).

No. 6.—Waterspouts, by W. E. Hurd (pp. 207–211); The Colorado River Situation (illus.), by J. H. Gordon (pp. 211–215); Ground Markings by Lightning (illus.), by F. F. Payne (p. 216); Franklin's Kite Experiment and the Energy of Lightning (illus.) (pp. 216–219), and Phenomena Preceding Lightning (pp. 219, 220), both by A. McAdie; Temperature Inversions at San Diego, as Deduced from Aerographical Observations by Airplane (illus.), by D. Blake (pp. 211–224; The Measurement of Sky Coloring, by F. Linke, trans. by W. W. Reed (pp. 224, 225); Blue-Sky Measurements at Washington, D. C., by I. F. Hand (pp. 225, 226); and Heavy Snowfall of April 27 and 28, 1928, in Upper Ohio Valley (illus.), by W. C. Devereaux (pp. 226–228).

SOILS—FERTILIZERS

Some comments on the hydrometer method for studying soils, B. A. Keen (*Soil Sci., 26 (1928), No. 4, pp. 261–263*).—This is a discussion of certain statements of Bouyoucos (E. S. R., 59, p. 509). Though admitting the rather close reproducibility of the hydrometer method results, and specifically stating with respect to the hydrometer soil analysis that his comment here presented "is not intended . . . to deny its value as an empirical method," which value he finds to be considerable, the author insists upon the essentially empirical character of the procedure, referring to its deviser's most recently published figures as illustrative of his contention that the "accurate repetition of a given result does not turn a qualitative method into a quantitative one, if we retain, as we ought, the strict meaning of these words."

Fundamentals of practical soil science, H. Stremme (*Grundzüge der Praktischen Bodenkunde. Berlin: Borntraeger Bros., 1926, pp. VIII+332, pls. 10, figs. 7*).—The viewpoint of this new textbook of soil investigational practice is set forth in the brief statement of the author's preface to the effect that the numerous textbooks of soil science bring out too little the points which are to be observed immediately upon and within the soil in the field (draussen). The plan of the book is indicated in the chapter headings, which, with a brief introduction, are as follows: The methods of investigation in the open, the decomposition of rock, primitive and cultivated soils, kinds and types of soil, the climatic soil types, the influence of soil waters and of ground waters on the kinds and types of soils, the differences among soil types, and soil maps.

Soil survey of the Moapa Valley area, Nevada, F. O. Youngs and E. J. Carpenter (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+749–774, pls. 2, fig. 1, maps 2*).—The area surveyed is located in southeastern Nevada, comprises 80,000 acres, and possesses a varying topography, including comparatively level bottom lands, gently sloping alluvial fans at the mouths of the lateral washes, and bench lands, the edges of which form very distinct escarpments, while their main portions are for the most part well dissected by erosion.

In the survey here reported 8 soil series, subdivided into 16 types, are recognized, only one of which, Redfield fine sand, reaches an areal extent of as much as 7.5 per cent of the section under consideration. The preponderant soil condition is that of rough broken and stony land, unclassified, in which category is placed 56.1 per cent of the Moapa Valley area.

Concerning Rhode Island soils in different parts of the State, B. L. Hartwell and J. B. Smith (*Rhode Island Sta. Bul. 214 (1928), pp. 24, figs. 3*).—This investigation included chemical and mechanical analyses, determinations of the lime requirement, and soil fertility and other tests.

In general, the components extracted from the soils examined by hydrochloric acid of sp. gr. 1.115 were found not related to the immediate needs of the soils.

On unlimed soils, corn field tests indicated soil needs in the decreasing order phosphorus, nitrogen, potassium, but in one of the soils phosphorus did not seem to be the primary deficiency after liming. The earlier chemical methods for determining soil acidity proved less useful than a procedure consisting essentially in the digestion of the soil sample with diluted ammonia followed by titration of the excess alkalinity with dilute hydrochloric acid.

Field tests with turnips following liming indicated phosphorus and nitrogen as the principal deficiencies in about equal numbers of cases. Out of 38 field tests with alfalfa only 3 failed to show improvement following the application of limestone at the rate of 2.5 tons per acre. Surface soil samples from 12 areas representing about 2,000 acres showed soil acidity high in about two-thirds and medium in about one-third of the samples. Nitrogen ranged from 0.138 to 0.359 per cent and phosphoric acid soluble in 2 N acetic acid from 14 to 78 parts per million.

The soils of Prince Edward Island, F. T. Shutt (*Canada Dept. Agr. Bul. 100, n. ser. (1928), pp. 20, fig. 1*).—This bulletin reports chemical analyses of 50 surface and subsurface soils, the tabulated figures covering moisture, loss on ignition, insoluble mineral matter, combined iron and aluminum oxides, calcium oxide, magnesium oxide, nitrogen, phosphoric anhydride (total and available), potassium as oxide (total and available), the lime requirement calculated both as calcium carbonate and calcium oxide, and the pH value; mechanical analyses for the same samples in which were determined the percentages of stone and rock fragments, fine gravel, coarse, medium, fine, and very fine sand, silt, and clay, together with the textural classification of the sample in each case; and a discussion of the information presented as a basis for the maintenance and improvement of the fertility of Prince Edward Island soils.

The general procedures suggested are (1) addition of humus-forming materials, farm manures, and both legume and nonlegume green manure crops, together with the adoption of short rotations, including a legume crop; (2) liming for all crops except potatoes, both for the correction of acidity and to supply calcium as a nutrient; and (3) "the rational use of fertilizers," in most cases a complete fertilizer.

[A schematic sketch of the climatic-zone soil types of Czechoslovakia] V. Novák (*Sborn. Čěskoslov. Akad. Zeměděl.* (*Ann. Czechoslovak Acad. Agr.*), *1 (1926), No. 1, pp. 67–75, pl. 1; Ger. Abs., pp. 74, 75*).—The author presents a sketch map of the climatic soil types of Czechoslovakia, noted as the first attempt of its kind, together with a general characterization of the fundamental soil formative factors, and concludes that the determining factors of the soil-forming processes of this region have been (1) the prevailing humidity and (2) the fact that the greater part of the region has had forest cover. Czechoslovakia is therefore considered to lie in general in the region of podzol-producing soil formative processes. An exception is noted in the case of steppe soils, considered to indicate a dryer climate where the soil formative processes have tended toward the chernozem. A general division of all the Czechoslovakia soils into six fundamental types is made as follows:

(1) Podzolic soil types subdivided into (*a*) middle European brown soils, less developed podzolic soils mostly in regions which have been occupied by deciduous forest, the so-called gray forest soils being assigned to this group, and (*b*) fully developed podzolic soils or genuine podzols in regions which have had coniferous forest cover; (2) chernozem types; (3) rendzina types; (4) soils of the most recent alluvium (meadow soils); (5) soils of the high mountainous region, "skeleton soils" characterized by predominantly physical weathering; and (6) scattered small areas of saline soils, resulting principally from poor natural drainage.

On the microscopic method of studying bacteria in soil, H. J. Conn (*Soil Sci., 26 (1928), No. 4, pp. 257–259*).—This is a further addition to the author's contributions (E. S. R., 59, p. 210) from the New York State Experiment Station on the staining of bacteria in films of soil suspensions by means of such fluorescein derivatives as erythrosin, eosin, and rose bengal. The improvement in staining power obtained by the addition of phenol to the staining solution or the pretreatment of the film to be stained with acetic acid having been shown in the previous work to be due apparently to the resulting decrease in the solubility of the dye, he has now studied the possibilities of the decrease in solubility of fluorescein dyes occasioned by the addition of traces of calcium salts and finds that "the greater the amount of calcium added (i. e., up to a certain point) the more intense the stain, and it is possible to secure a stain which is too deep." Though he has previously considered rose bengal as the most satisfactory of these stains for bacteria in soil suspension films, he now states that with a suitable addition of calcium the choice between these two dyes (erythrosin and rose bengal) is largely one of the shade preferred. The technique proposed in the present paper may be stated as follows:

Dissolve 0.15 gm. of gelatin in 1 liter of distilled water by heating gently, place in test tubes, 5 cc. or a little more in each tube, plug with cotton, and sterilize in an autoclave.

Dissolve 1 gm. of either erythrosin or rose bengal in 100 cc. of a 5 per cent aqueous solution of phenol containing from 0.001 to 0.1 per cent of calcium chloride. "The exact amount of calcium chloride is very important, and should be determined in advance for the dye sample used and the soil to be stained; one should employ just enough to give deep staining of the bacteria without too intense coloration of the dead organic matter." Do not remove the slight precipitate of the calcium salt of the dye usually present, but shake up into the staining solution for use.

Place 0.5 gm. of the soil in 4 or 5 cc. of the gelatin fixative, mix well, place a large loopful on a slide, spreading out to cover about 1 sq. cm., and allow to dry in a level position on a boiling water bath. Leaving the slide on the water bath, add 1 drop of the staining solution and stain for about 1 minute. Wash rapidly with water, dry, and examine with the high power of the microscope.

Sources of energy for Azotobacter, with special reference to fatty acids, P. L. Gainey (*Ann. Missouri Bot. Gard., 15 (1928), No. 2, pp. 113–168, figs. 5*).—Two cultures of Azotobacter were studied closely and a considerable number of others more generally in this investigation by the soil biology department of the Kansas Experiment Station. The thermochemistry of nitrogen fixation, the ability of various strains of the organism in question to utilize fatty acids up to and including those of six carbon atoms, specifically acetic, propionic, normal and isobutyric, normal valeric (including mono and trihydrated forms) and normal and isocaproic acids in the form of their calcium salts, constituted the subjects of the phase of the inquiry here reported upon. Dextrose was used in each case as a comparison standard of energy supply, the quantity of the acid or dextrose initially present and that remaining after various periods of incubation, together with the initial and final nitrogen contents having been determined for each of the media used. Record was made also of the relative rapidity of growth; and changes in hydrogen-ion concentration were tested qualitatively.

The strains of Azotobacter tested showed marked variations in their capacity to secure their energy requirement from the fatty acids supplied. Some appeared to be rather limited in this respect, whereas others utilized all of the fatty acids offered, these differences appearing not only qualitatively, in the degree of selectiveness shown by the various strains of the organisms, but also quantitatively. The iso acids were not as readily utilized as were the normal compounds.

A marked tendency toward reduction in the hydrogen-ion concentration in media in which an acid was being utilized by Azotobacter was observed, not only the cessation of growth but also in some cases the death of the organisms being apparently attributable to this cause. The quantity of nitrogen fixed was found more or less proportional to the quantity of the fatty acid utilized. "The quantity of nitrogen fixed per unit weight of acid consumed increases as the molecular weight or heat of combustion increases, provided comparisons are limited either to normal or iso compounds. There is some indication that the efficiency with which Azotobacter can utilize various acids, as measured by the quantity of nitrogen fixed, increases as the molecular weight increases, even when the comparison is based upon the energy content of the material utilized."

The cation with which the acid was combined appeared to play a very important part in determining the ability of the organism to utilize the particular acid; and the quantity of nitrogen fixed when various acids were utilized was more closely correlated with the energy content than with the actual weight of the material consumed.

Practical soil sterilization by heat for glasshouse crops, W. F. Bewley (*[Gt. Brit.] Min. Agr. and Fisheries Leaflet 209 (1927), pp. 15, pl. 1, figs. 2*).—Baking, stated to be limited to relatively small quantities of soil, and steaming methods for soil sterilization, variously described as the "small grid" method, the "tray" method, and the "spike" method, in which last-named procedure 2-ft. spikes of ¾-in. iron pipe are connected to the steam supply by suitable lengths of rubber hose, are described and figured, and the subjects of the purpose of steaming, manurial treatment to follow steaming, and chemical agents as against steaming are briefly discussed. In connection with the last-named topic the following comparative figures with respect to tomato crop yields are given, the yield from the unsterilized control soil being taken as 100: For steamed soil 180, for soil treated with cresylic acid 154, and for other liquid sterilizing chemicals 114.

Data are also given to show that steaming once in four years, which is stated to be sufficient, costs only one-ninth more than annual applications of cresylic acid, shown to be less effective when also carried out over a 4-year period. See also previous notation of similar work (E. S. R., 56, p. 46).

The influence of artificial manuring on the hygroscopicity and on the hydrogen-ion concentration of soils, F. Heinrich (*Die Beeinflussung der Hygroskopizität und der Wasserstoffionenkonzentration des Bodens durch Künstliche Düngung. Inaug. Diss., Albertus-Univ., Königsberg, 1926, pp. VI+51, figs. 7*).—The two subjects indicated in the title are discussed in separate articles.

I. *The influence of artificial manuring on the hygroscopicity of soil.*—A source of error was discovered in an insufficiently exact adherence to the directions in the Mitscherlich hygroscopicity method. The author believes that an augmentation of the results by capillary water can be introduced through but slightly altered experimental conditions, and that a false conclusion can easily be drawn from such erroneous results.

No alteration of the hygroscopicity by fertilizer applications in any way approached in practice could be demonstrated. With an extraordinarily large fertilizer application (more than 20,000 kg. per hectare) of sulfates, a lowering of the hygroscopicity became noticeable, this effect being considered to have a colloid chemical explanation.

It was observed that the total hygroscopicity of the soil salt mixture in the case of the soils having a hygroscopicity higher than that of the Hohen Bocka sand was lower than the calculated value. The difficulties of the inequality in vapor pressure between salt solutions and 10 per cent sulfuric acid made impossible an absolutely exact determination of the water absorbent action of the salts, but in extreme cases of soil fertilizer mixtures some irregularities showed themselves in a concentration of the total hygroscopicity values observed and those calculated. The hygroscopicity calculated for the fertilizer mixtures with the Hohen Bocka sand agreed well with that observed. The increase in this case was closely linear (geradlinig). Possible irregularities were also noted as between the same surface soils and varying fertilizer applications, as well as between different surface soils and the same fertilizer applications. Since the difference between the total hygroscopicities as calculated and as observed was often many times the soil hygroscopicity itself, it is considered that this can not be attributed to a colloid chemical action alone.

II. *The influence of artificial manuring on the hydrogen-ion concentration of soils.*—Fertilizer applications approached in practice brought about only a very slight increase in the hydrogen-ion concentration of the soil. In the case of very heavy fertilizer applications (about 20,000 kg. per hectare), however, the lowering of the pH value became distinctly noticeable. A difference in the effects of chlorides, nitrates, and sulfates could not with certainty be determined, though ammonium sulfate appeared to have relatively the most effect. The buffer action appeared in some measure related to the texture (grösse) as well as to the nature and condition of the surface soil, but the influence of lime on the soils under examination often obscured this relation. The last-mentioned observation is discussed at some length.

The forms of acidity and the absorption capacity of soils and the importance of these agencies in liming and manuring with rock phosphate [trans. title], D. L. Askinazi (Askinasy) (*Trudy Nauch. Inst. Udobr.* (*Trans. Sci. Inst. Fert.* [*Moscow*], *No. 38* (*1926*), *pp. 40; Ger. abs., pp. 39, 40*).—The author emphasizes the importance of the determination of soil acidity in estimating the crop-producing power of soil, and, in Russia especially, in the solution of the question of rock phosphate as well as lime treatment, but finds the methods for the determination of lime requirement at present on record to give inconsistent results. The work reported in the present paper was therefore directed to the purpose of ascertaining the relation of the soil to the reagent applied in each method, the following being among the inferences drawn from the work:

(1) The many methods for the determination of soil acidity do not give consistent results because they determine different acidic, or potentially acidic, constituents of the soil. (2) Soil acidity can be classified into two forms: Active acidity, and a passive form subdivided into (*a*) unsaturation and (*b*) hydrolytic acidity. (3) The published methods for the determination of passive acidity can be classified into the two groups of (*a*) methods determining only the unsaturation and (*b*) methods which determine both unsaturation and hydrolytic acidity. (4) The replacement of exchangeable bases in the soil by the cations of neutral salts takes place according to their equivalents, but the exchange reaction of soils with salts of alkaline reaction with sodium acetate, for example, or with free alkalies, must be represented in the following way: (*a*) In part an equivalent exchange takes place in the cations of these salts with calcium, magnesium, and other adsorptively bound bases of the soil. (*b*) There is an equivalent exchange of the alkali formed by the hydrolysis of these salts with the adsorptively bound hydrogen ion of the soil in the broader sense

of the term, that is, with the hydrogen ions which possess the capacity for exchange reactions with neutral salts, and also with the hydrogen ions which can enter into exchange reactions only with salts of alkaline reaction and with free alkalies.

(5) Upon treating soils with baryta and then washing out with freshly boiled distilled water, the initial absorption capacity of the soil was increased two or threefold. (6) This increment showed itself, for the podzol soils, to be proportional to the initial absorption capacity; but (7) on treating permutite with baryta the barium was exchanged with the base (ammonia) of the permutite approximately according to the equivalents, and the absorption capacity of the permutite was not augmented.

Further observations and conclusions are also recorded.

Some factors involved in studying the fixation of phosphorus by soils, A. G. WEIDEMANN (*Soil Sci., 26 (1928), No. 4, pp. 281–290*).—This reports a study of phosphorus fixation in two highly acid muck soils and two more nearly neutral mucks. The four soils were treated with solutions of monocalcium phosphate and the neutral mucks with potassium chloride and hydrochloric acid, respectively. The two highly acid mucks were studied after treatment with various quantities of calcium oxide, and their phosphorus fixative properties were examined after treatment with as much distilled water as they would hold "unfree."

The very acid mucks showed indications of negative phosphorus fixation after treatment with highly concentrated monophosphate solutions. This property is attributed to the inability of these soils to fix from concentrated solutions as much phosphorus as is present in the water rendered "unfree," some of this phosphorus being considered to be thus liberated so that it increases the concentration of the remaining solution. Mucks of relatively high pH value did not show negative phosphorus fixation in any concentration of phosphate solution used. "This is, no doubt, due to the fact that the phosphorus reacts chemically with the lime to form an insoluble compound."

Very acid mucks showed no indications of negative phosphorus fixation when they had been treated with lime before the fixation test was made, the explanation given being that here again the phosphorus reacts with the lime to form an insoluble compound. Mucks of high lime content when treated with acid lost a considerable part of their ability to fix phosphorus from calcium monophosphate solutions. It is further concluded that "when mucks that show an indication of negative fixation are treated with as much water as they can render unfree the phosphorus fixation results will be positive regardless of the concentration of the phosphorus solution with which they are treated."

Colloidal behavior of soils and soil fertility.—V, The distribution of soluble and colloidal iron and aluminum in soils, J. S. JOFFE and H. C. MCLEAN (*Soil Sci., 26 (1928), No. 4, pp. 317–325*).—"From a study of the anion effect and reaction of disperse medium on the condition of state of iron and aluminum in soils, it is clear that as far as the inorganic compounds of iron and aluminum are concerned the molecular state of either one of these two cations rarely persists in the soil." It is considered likely, however, that in close proximity to roots and about active centers of nitrification, iron and aluminum do exist in the soluble state temporarily (E. S. R., 59, p. 716). It is also concluded that "colloidal iron and alumnium sols of various degrees of dispersion may exist, especially in the presence of the nitrate anion and at moments of the relative absence of the sulfate and phosphate ions."

Dialysis experiments on samples of surface and subsurface soils from the soil fertility plats of the New Jersey Experiment Station showed that only under conditions of extreme acidity, such, for example, as those on a plat barely capable of supporting plant life, can iron and aluminum exist in the soil in the molecular state. With respect to the sol state of soil iron and aluminum, it is stated that water extracts of the dialyzed soils should contain the iron and aluminum present in this condition. In experiments with a large number of soils very little of these elements could be demonstrated in such extracts, however.

Fertilizer treatments of the soils investigated did not appear to have any marked effect on the state of aggregation of the iron and aluminum, though a tendency of the mineral fertilizers to coagulate the colloids was observed. The greater part of the iron and aluminum separated from the mineral complexes in the process of weathering was found to exist in the soil in the gel state and to be distributed as such throughout the soil profile. Barium chloride extracts of samples of the same soils used in the dialysis experiments gave quantities of iron and aluminum up to 370 parts per million, this result being attributed, however, to "the solubility effects of the acid produced by the release of hydrogen ions in the process of replacement with the barium ion. The hydrochloric acid thus formed reacts with the gels, bringing them into solution." Less of iron than of aluminum was dissolved as a result of the acid produced by the replacement process, the aging of the colloids being suggested as probably connected with the effect observed.

The effect of sodium chloride and carbonate on the growth of asparagus, B. L. HARTWELL, J. B. SMITH, and S. C. DAMON (*Rhode Island Sta. Bul. 213 (1928), pp. 16, fig. 1*).—This bulletin deals with the results of applying sodium chloride and sodium carbonate with varying quantities of lime and insufficient potassium on asparagus from 1919 to 1926. The sodium salts were gradually increased to a final quantity equivalent to 2,000 lbs. of soda per acre.

Potassium chloride tended to decrease, sodium chloride to increase, active soil acidity. Quantities of 1,200 and 1,500 lbs. per acre of soda broadcast over weeds in early July (1924) killed chickweed when applied as carbonate, but had little effect on purslane; while the chloride had no apparent effect upon either weed. The omission of sodium from the treatment of certain plats which had previously received it decreased the asparagus yield on plats which had been receiving sodium chloride, but not on plats which had been under treatment with sodium carbonate.

In cases of extreme potassium deficiency, both sodium carbonate and sodium chloride increased the yields. In plats where about equal soil acidity was maintained for a time in the chloride and carbonate plats, the number of plants and shoots and the weight of the shoots were greater on the chloride than on the carbonate plats.

"During the last three years, in which large quantities of soda were added to certain plats, the yields without soda were about alike on the more-limed chloride and on both the less and more-limed carbonate series; but supplementation with sodium chloride resulted in nearly a threefold increase in yield, whereas practically no increase was produced by sodium carbonate. This failure of sodium carbonate to increase the crop can scarcely be attributed to too much alkalinity, because the more-limed carbonate series yielded more than the less-limed one. The osmotic pressure was doubtless less with sodium carbonate than with sodium chloride."

[Soil treatments for fall grains], G. M. GRANTHAM (*Michigan Sta. Quart. Bul., 11 (1928), No. 1, pp. 17–19, fig. 1*).—Early plowing and compaction of the soil to follow soon after are recommended, together with liming and the use of complete fertilizer to give the plants, among other advantages, a vigor sufficient to enable them to withstand destructive winter weather.

The average yield per acre of 6 wheat crops grown in 4-year rotations is given as 7.57 bu., while 6,300 lbs. of limestone (one application in 11 years) increased the yield to an average of 18.78 bu. per acre, and the same liming with applications of complete fertilizers at intervals in the rotation brought the average to 30.3 bu. per acre.

Soil fertility experiments on Volusia and Westmoreland soils, J. W. White and F. D. Gardner (*Pennsylvania Sta. Bul. 229 (1928), pp. 31, figs. 5*).—Soil fertility experiments, for the most part of the usual type, are reported and illustrated in this bulletin. The two soil areas upon which the work was carried out differed markedly in their response both to lime and to nutrients. On the basis of crop increases secured, the relative value of limestone when used with superphosphate (acid phosphate) in the grain rotation was, on the Volusia soil, 63 and, on the Westmoreland soil, 17. Used with lime, the relative values of superphosphate on Volusia and Westmoreland soils became 37 and 70, respectively. Potassium in the grain rotation had a value of 52 on the Volusia soil as compared with 13 on the Westmoreland. Nitrogen applications were found of little value in the grain rotation on the Volusia soil, while on the Westmoreland soil an increase of 18 per cent in grain production was secured.

[Fertilizer experiments], E. M. Straight (*Canada Expt. Farms, Sidney (B. C.) Sta. Rpt. Supt. 1926, pp. 57 58*).—Rotation-fertilizer experiments of the usual type are noted, with tabulated results. No consistent advantage from the use of fertilizers was demonstrated either on the potato crop or on a following oats crop grown to show the residual effect, if any, of the chemicals applied to the potatoes. Well-distributed check plats averaged about the same yields as did the fertilizer plats with both crops.

Soils and fertilizers in 1926, E. J. Russell (In *Agricultural Research in 1926. London: Roy. Agr. Soc. England, 1927, pp. 134–167*).—This rather extensive general report by the director of the Rothamsted Experimental Station is concerned not only with British investigations but with those of other countries also, "particularly with certain American work, both in Canada and the United States."

The report deals with the new fertilizers, phosphates and potash, effectiveness of fertilizers, field experiments, and new possibilities. Under this last-named caption special mention is made of the work of the Rhode Island Experiment Station with manganese as an auxiliary plant nutrient and its effect on the yields of spinach and other crops (E. S. R., 54, p. 450). "I saw few results more striking than these in the United States."

The treatment of the second subject of the report comprises sections on the effect of fertilizers on the soil, soil constituents, soil analysis, cultivation, and soil microorganisms. A considerable reference list is appended.

Manurial experiments in the South Island of New Zealand previous to 1923, F. W. Hilgendorf (*New Zeal. Dept. Sci. and Indus. Research Bul. 1 (1927), pp. 29*).—"The paper collates and coordinates the results of some 1,793 manurial trials made on turnips, swedes, potatoes, mangels, wheat, and oats in the South Island of New Zealand during the years 1895-1923. Most of the trials . . . consisted of an unmanured plat and six or seven differently manured ones, all in the same field. The replications (which varied up to 62 in number) of the trials were attained by conducting the same trials on many farms and during several years."

Commercial fertilizers, H. R. Kraybill et al. (*Indiana Sta. Circ. 155 (1928), pp. 70, figs. 2*).—The usual annual report of analyses of commercial fertilizers and advice to purchasers are given for the year 1927 (E. S. R., 58, p. 211).

Analyses of commercial fertilizers, season of 1927–28, R. N. Brackett and D. H. Henry (*South Carolina Sta. Bul. 250 (1928), pp. 66*).—Analyses of 1.521 official commercial fertilizer samples, of which 1,283 were complete fertilizers while the remainder consisted of small numbers of samples of cottonseed meal, single nutrient fertilizers, and incomplete mixtures, are reported in this bulletin in the usual form (E. S. R., 57, p. 814).

AGRICULTURAL BOTANY

Apparatus for growing plants in soil under microbiologically controlled conditions, E. P. Deatrick (*Jour. Amer. Soc. Agron., 20 (1928), No. 6, pp. 643–645, fig. 1*).—The apparatus here figured and described (in connection with its operation) as designed for use in connection with the growing of plants in potted soil is claimed to condition a method for easily supplying sterile water and a method for covering the soil.

Measurement of leaf area using the photo-electric cell, R. W. Gerdel and R. M. Salter (*Jour. Amer. Soc. Agron., 20 (1928), No. 6, pp. 635–642, figs. 4*).—In connection with an apparatus, which is described, for making rapid measurements of leaf area by using the selenium photo-electric cell, construction data are given to show the assembly of the apparatus. The accuracy is shown by a probable error for a single determination of about ±3.3 per cent for measurements of areas of 500 sq. cm., ±1.1 per cent for 1,000 sq. cm. area, and ±0.8 per cent for 2,000 sq. cm. area.

On cytochrome, a respiratory pigment, common to animals, yeast, and higher plants, D. Keilin (*Roy. Soc. [London], Proc., Ser. B, 98 (1925), No. B 690, pp. 312–339, figs. 6*).—It is claimed that a respiratory pigment, to which have been applied the names myohematin and histohematin, has been found to exist and to be widely distributed. This is further stated to be not a simple compound but a complex of three distinct hemochromogen compounds, the nature of which is not yet clear. It is termed by the author "cytochrome," signifying, tentatively, merely intracellular pigment.

Cytochrome is claimed to be an intracellular respiratory catalyst, common to animals, bacteria, yeast, and higher plants. In a reduced state it shows a characteristic absorption spectrum with four bands (one composed of three secondary bands), the positions of which in all organisms are approximately the same. In the oxidized form no clear absorption bands are found, but faint shading is apparent in a region indicated.

Cytochrome is easily oxidized with air and reduced by the normal activity of cells or by a chemical reducer. The condition of cytochrome, as seen spectroscopically in the living organism, denotes only the state of equilibrium between the rate of its oxidation and reduction at that particular time. The behavior of cytochrome in living organisms is dealt with in detail. Cytochrome yields as derivatives three hemochromogens, which give O_2 and CO compounds. It is claimed that cytochrome and its derivatives are at least partly responsible for the peroxidase reactions in organisms. The noncolored portions of plants show the existence of a hemochromogen-like complex (modified cytochrome), as well as of cytochrome, both yielding, in strong KOH, characteristic hemochromogens which give O_2– and CO–compounds. Cytochrome exists in aerobic bacteria and can be oxidized and reduced as in other organisms.

Different modes of adaptation to altitude by Poa annua [trans. title], J. Bouget (*Rev. Gén. Bot., 40 (1928), No. 474, pp. 321–327*).—In subalpine regions and under the influence of humidity, *P. annua* is a hygrophilous, perennial creeper, multiplying by means of rhizomes. This hygrophilous plant, when carried into alpine regions, undergoes a new transformation under the influence of a drier medium. It loses its repent habit and also its rhizome habit, but it remains a perennial. It acquires the property to reproduce sexually, showing flowers and fertile seeds.

Wheat, soybean, and oat germination studies with particular reference to temperature relationships, H. K. Wilson (*Jour. Amer. Soc. Agron., 20 (1928), No. 6, pp. 599–619*).—Studies are reported as made on the germination of varieties of wheat (Turkey, Red Rock, and Marquis), soy bean (Manchu, Virginia, and Wilson), and oats (Silvermine).

The rate of initial germination of the three crops appeared to conform to the principles of the Van't Hoff law for chemical reactions, though it is admitted that the large number of chemical processes and the biological aspect involved in germination make it probable that the application of the Van't Hoff law is possible largely because of its flexibility. Wheat, soy beans, and oats required practically the same length of time to complete a germination test. A temperature of 15° C. was the optimum for the germination of the three wheat varieties. Each wheat variety showed decreased percentage of germination with each increase of temperature above 15°, the poorest performance appearing at 30°. The cardinal points for the germination of wheat are supposedly the same for seed produced at any point within the United States.

Mold attack on germinating wheat increased with the germinating temperature, being of little importance at temperatures of 10 and 15°. An inverse relationship appeared between the total percentage of germination and the percentage of moldy kernels. Injuries to the inner membranes of the seed allowed fungi to gain easy entrance to the nutriment in the wheat kernel. The mold, after starting its growth, entered into direct competition with the embryo of the weakened seed for the energy stored within the endosperm.

It is suggested that a temperature of 30° affects the protoplast of the wheat kernel, permitting the outward leaching of soluble food materials which are readily attacked by fungi.

Apparently, mold attack on the germinating soy bean had no relationship to the germinating temperature, since the temperatures used were not high enough to weaken the seed. The maximum germination temperature for the soy bean is higher than that of wheat. The impermeability of the soy bean seed coat varied inversely to the germinating temperature. It is thought that the rate of water movement into the seed was accelerated at the higher temperatures on account of the lessened viscosity of the water. The time saved in completing a germination test at the higher temperatures indicates that 25 and 30° temperatures are equally suited to oats germination.

As with soy beans, fungal attack on germinating oats was of little importance and was associated with the decay of nonviable seed.

Stimulation, toxicity, and antagonism of calcium nitrate and manganese chloride as indicated by growth of wheat roots, L. V. Barton and S. F. Trelease (*Bul. Torrey Bot. Club, 54 (1927), No. 7, pp. 559–577, figs. 3*).—A study of elongation in the primary roots of wheat seedlings in single salt solutions of manganese chloride and calcium nitrate and in solutions containing both of these salts is said to have shown that manganese chloride, in simple solution of proper concentration, exercises a pronounced stimulating effect on the root elongation of very young wheat seedlings. Calcium nitrate, in dilute solution, showed no significant stimulating effect, and at high concentrations it was found to be far less toxic than manganese chloride. Equally toxic solutions of these salts do not remain equally toxic when diluted to the same degree.

Calcium nitrate showed a marked effect in reducing the toxicity shown by higher concentrations of manganese chloride in simple solution, and it also reduced the stimulating effect that low concentrations of manganese chloride exhibited in simple solution. The influence of calcium nitrate in diminishing the toxic action of manganese chloride appears to be much more pronounced than the effect of manganese chloride on the toxicity of calcium nitrate.

Differences were observed in appearance of the roots grown in single salt solutions indicating specific toxicity. The symptoms of poisoning by manganese chloride are characterized by brown rings distributed at rather regular intervals on the root.

Action of anesthetics on sugar cane sprouting [trans. title]. E. M. CALVINO and F. MASTIO (*Agr. Colon.* [*Italy*], *19* (*1925*), *No. 12, pp. 441–453*).—Favorable results were secured as regards quickness and percentage of germination. Ether and acetylene greatly exceeded chloroform and ethyl alcohol in practical effects.

The production of intumescences in Transparent apple by ethylene gas as affected by external and internal conditions, R. H. WALLACE (*Bul. Torrey Bot. Club, 54* (*1927*), *No. 6, pp. 499–542, pl. 1, figs. 2*).—The data reported in the author's first paper (E. S. R., 58, p. 821) were obtained during the period from September to March. The work was extended to cover the entire year, and the experiments on cuttings of Transparent apple are said to show that ethylene stimulation may induce the formation of intumescences within a wide range of environmental and biological conditions. Tests made every month throughout the year indicate no pronounced seasonal or periodic variation in the sensitiveness of the tissues to ethylene stimulation. Humidities of from 67 to 92 per cent have no apparent effect on the ethylene response. No correlation appeared between the humidity percentage and the number or extent of the intumescences.

Temperature exerts a marked influence on the number and size of the intumescences, the optimum temperature for their formation being near 15° C. and the maximum about 30°. The intumescences form equally well in continuous light, in continuous darkness, or in alternate light and darkness. Ethylene and illuminating gas gave about the same responses when run in parallel series of concentrations from 0.05 to 50 per cent. Intumescences do not form in the absence of oxygen. They do not develop in 25 per cent or more of carbon dioxide.

Mixtures ranging from 75 per cent of ethylene and 25 per cent of oxygen to 1 part of ethylene to 1,000,000 or 100,000,000 parts of air will induce the formation of intumescences at least in the ends of cuttings of Transparent apple.

Exposures to a mixture of 1.5 per cent ethylene and 98.5 per cent air for periods ranging from 7½ minutes to continuous exposure through the experimental period all gave responses. No variation was observed in the number or extent of the intumescences formed with this range of exposure times. Ethylene showed no bleaching effect on the chlorenchyma of the stems of Transparent apple.

The relation between the development, structure, and functioning of the nodules on Vicia faba, as influenced by the presence or absence of boron in the nutrient medium, W. E. BRENCHLEY and H. G THORNTON (*Roy. Soc.* [*London*], *Proc., Ser. B, 98* (*1925*), *No. B 691, pp. 373–399, pls. 4, figs. 5*).—The authors compare the growth and functioning of nodules on *V. faba* in cultures containing or lacking boron. Lack of boron gives a limited and defective vascular supply, running only a short distance into the nodule. Nodules having no vascular strands remain minute and do not swell out or form the so-called bacteroids. In plants having these abnormal nodules very little nitrogen is fixed.

In correspondence with absence or weak development of vascular strands in the nodule, the bacteria tend to become parasitic, attacking the protoplasm of the host cell, chiefly the more densely protoplasmic cells of the nodule. It is suggested that this change in the relations between the microorganism and its host is connected with the loss or reduced supply of the carbohydrate energy material normally brought into the nodule by the vascular strands, the bacteria thus being reduced to making use of the protoplasm of the host as a source of energy.

The state of iodine in some Rhodophyceae [trans. title], E. Chemin (*Rev. Gén. Bot., 40 (1928), No. 471, pp. 129–145*).—Evidences regarding the presence and state of iodine in certain of the Rhodophyceae are presented. with discussion.

Some aspects of degenerescence in plastids and applications to parasitism [trans. title], J. Beauverie (*Rev. Gén. Bot., 40 (1928), Nos. 472 pp. 206–225, figs. 5; 473. pp. 264–276, figs. 2*).—Of the two parts of this account, the first deals with experimentation and its results as regards chloroplasts and chromoplasts, and the second with applications in cases of parasitized tissue and in a study of immunity.

New species of Fungi Imperfecti [trans. title], M. P. Petrov (*Mater. Mikol. i Fitopat. (Mater. Mycol. and Phytopath.), 6 (1927), No. 1, pp. 54–57, figs. 7*).—The author describes (with illustrations) as to morphology, cultural characters. and habitats, supposedly new species of fungi, including *Stagonospora alchemillae, Camarosporium hypericorum, Septoria hypochoeridis, Rhabdospora silenes, Phoma erigerontis*, and *P. filaginis arvensis*.

The fungus flora of the soil [trans. title], M. M. Samutsevich (Samoutsevitsch) (*Mater. Mikol. i Fitopat. (Mater. Mycol. and Phytopath.), 6 (1927), No. 1, pp. 204–213, figs. 5*).—Isolations of fungi were made from a garden podzol and from a slightly swampy forest soil. Besides the organisms noted by other investigators, the author found such fungi as *Diplocladium macrosporium* and *Diplosporium album*. Among the others some new species were found, including *Mucor ramosissimus* and *Verticillium vinosum*. The species do not vary greatly with the depth, though the Mucors are found mostly in the upper layer. The soil samples taken in the fall showed a more abundant fungus flora. *Rhizopus nigricans* occurred for the greatest number of times in the isolations, and this was followed by Fusarium. *Monilia koningii* was rarely encountered. The forest soil showed a greater variety of fungi than did the garden soil. The author describes and illustrates the new species isolated.

Ergot [trans. title], N. A. Rozhdestvenskiĭ (Rojdestvenski), (*Mater. Mikol. i Fitopat. (Mater. Mycol. and Phytopath.). 6 (1927), No. 1, pp. 123–165*).—In a review of the subject of ergot. the author deals with the morphology, modes of infection, systematic position of the species, and hosts; the biological forms of ergot, cultural and physiological characters, and geographic distribution; the economic importance of ergot; properties as regards poisoning of animals and lethal dose, chemical composition, the poisonous fraction, the alkaloids, and methods of determining the amounts of ergot on grain and in flour; control measures; and a historical review of ideas regarding ergot.

Mucorales in nature and methods of their isolation in pure culture [trans. title], N. A. Naumov (Naoumov) (*Mater. Mikol. i Fitopat. (Mater. Mycol. and Phytopath.), 6 (1927), No. 1, pp. 180–192*).—A review is given of the distribution, habitats, and physiological reactions of the Mucorales, also of cultural methods and cytological preparations.

The soil is the primary source of the Mucorales, harboring about one-third of all known species. Their function in the soil is not very well understood, but it is known that they break down the amino acids and amides, forming ammonia and reassimilating it, thus competing with green plants for the nitrogen. Sandy soils harbor certain typical forms of the Mucorales, heavy soils harboring other forms. Certain forms, as *Rhizopus nigricans* and *Mucor racemosus*, live exclusively around human dwellings. The method of single spore isolation is described.

GENETICS

Opportunities for research in mammalian genetics, C. C. Little (*Sci. Mo., 26 (1928), No. 6, pp. 521–534*).—The development of genetics is briefly reviewed, and it is pointed out that insects, while making valuable contributions to the fundamentals of the subject, are not adaped for the determination of the details of the subject applying to mammals. Insects are remarkably definite and fixed in a biological sense, while mammals lack this definiteness and are more responsive to environmental influences. The more important groups of genetic problems capable of successful investigations in laboratory mammals are designated as the genetic bases for size and growth, fertility and sterility, susceptibility or resistance to disease, lethal action of genes during development, and psychological differences. Progress made along these lines is very briefly reviewed, and future possibilities and needed work are indicated.

Genetics at the Anikowo Station, L. C. Dunn (*Jour. Heredity, 19 (1928), No. 6, pp. 280–286, figs. 5*).—In the introduction to a series of articles from a translation by B. F. Glessing on the genetics of the domestic fowl, from the Anikowo Genetical Station, Moscow, there is presented a general account of the station and the work in progress with poultry, cattle, sheep, guinea pigs, and bees.

Genetic evidence of a selective segregation of chromosomes in a second species of Sciara (Diptera), C. W. Metz (*Natl. Acad. Sci. Proc., 14 (1928), No. 2, pp. 140, 141*).—A case of selective segregation in *S. similans* is described similar to that previously noted in *S. coprophila* (E. S. R., 57, p. 221). In the present case, crossing a wild type male with mutant females described as broad winged produced 32 wild type and 28 broad-winged offspring, the latter being all females. Wild type females from this type mated to wild type males produced only wild type offspring, while broad-winged females mated to wild type males produced both types of offspring with a deficiency in the broad class, resulting from poor viability. Broad males mated to wild type females produced only broad offspring, and broad males × broad females produced only broad offspring. In the above and other tests heterozygous broad males were found to transmit only the genes derived from their mothers. Broad was clearly dominant to the wild type. It is suggested that all the paired chromosomes in the species *S. coprophila* and *S. similans* undergo such segregation in that only chromosomes derived from the mother are transmitted by the sons and vice versa.

Chromosome aberrations and the improvement of animal forms, C. B. Bridges (*Jour. Heredity, 19 (1928), No. 8, pp. 349–354*).—The difficulties in the use of aberrations for animal improvement are noted as the frequent weakness or sterility of such forms and an inability to propagate animals asexually. Polyploid stocks and the like must be continued if fertile by constant selection as they do not usually produce uniform types. Recognition of the usefulness of aberrant forms requires eternal vigilance.

Crossing-over between the W and Z chromosomes of the killifish Platypoecilus, A. C. Fraser and M. Gordon (*Science, 67 (1928), No. 1740, p. 470*).—In genetic investigations at the New York Cornell Experiment Station with the killifish *Platypoecilus maculatus*, in which the mode of sex determination is of the WZ type, crosses were made between red (R) spotted (Sp) fish and nonred (r) nonspotted (sp) fish. These characteristics are sex linked. Two cases of crossing over between W and Z chromosomes in the females were observed and at least one case in which both genes R and Sp were transferred from Z to the W chromosome. Further tests indicated that the exceptional female was not due to nondisjunction or sex reversal.

A case of close autosomal linkage in the fowl, A. S. Serebrovsky and S. G. Petrov (*Jour. Heredity, 19 (1928), No. 7, pp. 305, 306*).—In studies of the linkage relations between various characters in poultry at the Anikowo Genetical Station, Moscow, the mating of a rose comb (Wn) creeper (Rd) rooster of the formula $\frac{\text{Wn rd}}{\text{wn Rd}}$ with normal hens, $\frac{\text{wn rd}}{\text{wn rd}}$, produced 1 rose creeper, 22 rose normal, 33 single creeper, and 4 single normal, thus indicating a close linkage between these two factors with only 8 per cent of crossing over observed.

The effect of X-rays in producing return gene mutations, F. B. Hanson (*Science, 67 (1928), No. 1744, pp. 562, 563*).—In an effort to induce the return of mutations to the normal, male Drosophila carrying five mutant genes on the X chromosome, yellow body, white eye, forked bristles, bar eye, and Beadex wings, were X-rayed and mated to virgin double-X yellow females. There were no return mutations at the yellow, white, or forked loci, but there were 8 cases of normal wings instead of Beadex wings, though these did not breed true. Four cases of full eye individuals were observed breeding true. There thus appeared to be return mutations in 1 of 433 heavily treated males at this locus and 1 in 1,898 males receiving the lighter dose at this locus.

The formation of new species of fungi [trans. title], A. A. I͡Achevskiĭ (Jaczewski) (*Mater. Mikol. i Fitopat. (Mater. Mycol. and Phytopath.), 6 (1927), No. 1, pp. 239–294, figs. 2*).—The author discusses theories of evolution pertaining to the variability of physiological characters in fungi as compared with those in other biological forms, attributing much influence to the geographical distribution as regards the variability of the species and discussing the contributions on mycological geography, Lamarckism, Neo-Lamarckism, the mutation theory of De Vries, and the views of Weissman. A list of 155 references is appended.

Polyembryony in rice, J. W. Jones (*Jour. Amer. Soc. Agron., 20 (1928), No. 7, p. 774*).—In a cross between Yosemite and Nimai Kawa Mochi rice, one seed produced two hybrid seedlings, apparently alike during the entire growing season.

Mendelian inheritance with assortive mating, E. B. Wilson (*Natl. Acad. Sci. Proc., 14 (1928), No. 2, pp. 137–140*).—The author has calculated the correlation between parent and offspring and between siblings expected in hypothetical cases with and without assortive matings and with different percentages of recessives in the population.

Is pituitary secretion concerned in the inheritance of body-size? R. C. Robb (*Natl. Acad. Sci. Proc., 14 (1928), No. 5, pp. 394–399, figs. 2*).—The weights of the pituitary bodies were determined in 152 male rabbits of different stocks, including Flemish Giants, Polish, and Flemish-Polish crosses, and of varying ages from birth to senescence. From the analyses of these data and their correlation with the live body weight minus the weight of the stomach and intestines, it was concluded that there was no characteristic difference in the mass of the pituitary that could be correlated with the observed differences in the body weights and growth rate of Flemish Giants and Polish rabbits. There was a progressive increase in the logarithm of the pituitary weight which was linearly associated with the logarithm of the body weight. This association was considered as due to the correlation between the growth of the organism as a whole and that of its specific portions resulting from a common cause rather than an interrelationship.

The inheritance of human skeletal anomalies, B. L. Milles (*Jour. Heredity, 19 (1928), No. 1, pp. 28–46, figs. 13*).—Various congenital anomalies of the skull and cranium, trunk, and extremities, including polydactylism, are described in humans with reference to the ancestry and the frequency of occurrence of such abnormalities in previous generations.

A syncephalus thoracopagus monster in swine, J. E. Nordby and B. L. Taylor (*Amer. Nat., 62 (1928), No. 678, pp. 34–47, figs. 8*).—The authors describe the detailed anatomy of a syncephalus thoracopagus monster in swine observed at the Idaho Experiment Station.

"Bighead" of horses a heritable disease, B. M. Gonzalez and V. Villegas (*Jour. Heredity, 19 (1928), No. 4, pp. 159–167, figs. 4*).—A study of the occurrence of osteoporosis in horses at the University of the Philippines indicates that the disease is hereditary, the factor for its occurrence being dominant. Seven normal × normal matings produced all normals, while at least four of the five offspring of an osteoporotic stallion developed the disease and the fifth was blind, which was considered as related to the disease.

Exceptional color inheritance in Hereford cattle, W. R. Horlacher (*Jour. Heredity, 19 (1928), No. 1, p. 10, fig. 1*).—The occurrence of a black spot on the neck and within the red portion of the coat of a pure bred Hereford calf is noted.

Tortoiseshell tomcats and freemartins, T. H. Bissonnette (*Jour. Heredity, 19 (1928), No. 2, pp. 87–89*).—The author describes the fused placentae and membranes of two cat embryos. The union was so complete that separation of the circulation from one to the other embryo in the villi, either of the embryonic or of the maternal part of the placenta, could not be distinguished. The possibility of the membranes of cat embryos fusing indicates that the explanation for the tortoiseshell tomcat on this basis is not impossible.

Physiology of the corpus luteum.—I, The effect of very early ablation of the corpus luteum upon embryos and uterus, G. W. Corner (*Amer. Jour. Physiol., 86 (1928), No. 1, pp. 74–81, figs. 8*).—In a series of experiments, both ovaries of 7 rabbits were removed at 14 to 18 hours after mating, which is approximately 4 to 8 hours after ovulation, and 4 to 7 days later the females were destroyed and the ova recovered from the uterus. It was found that the blastocysts were considerably shrunken and much reduced in size as compared with those recovered from control rabbits, from which a single ovary was removed and the other ovary intersected and in some cases partly removed. In a further group in which the corpora lutea were grouped at one end of the ovary and that portion only removed at 15 to 20 hours after mating, the blastocysts also were degenerated. The experiments further showed that the endometrium did not undergo the normal progestational proliferation when both ovaries or that portion of the ovaries, including the corpora lutea, was removed at 14 to 20 hours after mating, which is indicated as the reason the blastocysts in these litters degenerated.

An experimental study of ovarian regeneration in mice, H. O. Haterius (*Physiol. Zool., 1 (1928), No. 1, pp. 45–54*).—In 96 female mice from which both ovaries were removed, ovarian tissue was found in 9 within 32 weeks after the operation, but it was concluded that such was due to incomplete removal of the ovaries rather than to regeneration of ovarian tissue.

Effects of sperm injections into female rabbits, W. T. Pommerenke (*Physiol. Zool., 1 (1928), No. 1, pp. 97–121*).—Through the injection of semen into female rabbits, antibodies were produced which caused the serum and vaginal secretions of the female animals to be toxic to the spermatozoa of the rabbit and the rat, and resulted in a reduction in the longevity of spermatozoa in the genital tract and infertility for a period of from 6 to 25 weeks following repeated injections. Such injections, however, had no effect on the oestrous cycle.

The effects of X-rays on productivity and the sex ratio in Drosophila melanogaster, F. B. Hanson (*Amer. Nat., 62 (1928), No. 681, pp. 352–362, figs. 2*).—In studies of the effect of X-rays on Drosophila it was found that a heavy dose of X-rays, described as T-4, caused a 77.3 per cent mortality in the eggs and 50.4 per cent mortality in the larvae and pupae, while a lighter dose given to females resulted in 58.3 per cent mortality in the eggs and 32.1 per cent mortality in the larvae and pupae. These were compared with 20.5 per cent mortality in the eggs and 17.2 per cent mortality in the larvae and pupae of the offspring of untreated females. Analyses of the sex ratios showed no significant differences resulting from the treatment. Many mutations appeared among the offspring which were classified in addition to gene mutations as somatic mutations, mosaics, and chromosome abnormalities. In the heavy treatment these occurred at the rate of 8.2 per cent, in the light treatment 0.6 per cent, and in the controls 0.059 per cent.

Reproduction in alcoholic mice.—II, Treated males: A study of prenatal mortality and sex ratios, E. C. MacDowell and E. M. Lord (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 110 (1927), Nos. 3–4, pp. 427–449, figs. 3*).—In continuing this series (E. S. R., 58, p. 320), studies of the effect of treatment of males by inhalation of alcohol fumes until they were made dead drunk on five days a week are reported.

The results indicate that the treatment increased the time between successive litters, but there were no general effects on the amount of prenatal mortality, though a slightly greater prenatal mortality was observed in litters sired by males from the dilute brown strain than in litters sired by males from the albino strain. This also showed in the average size of the litters born to females mated with males from the two strains. Classifying the litters according to the absolute number of young missing showed that in litters from alcoholized fathers there were less with no loss and a correspondingly greater number with losses of two young as compared with the controls, indicating a slight effect of the treatment on the viability of the young. The numbers born dead were considerably greater for those sired by treated fathers, 0.35 per cent for the albinos and 2.54 per cent for the dilute brown sires. The variations in the sex ratios observed in different groups and in different sized litters are discussed, from which it is concluded that the sex ratio was not modified by the treatment. In discussing the results of the present investigation in connection with the findings of others, the authors suggest that the reaction of sperm to alcohol may depend on the presence or absence of weakening or resistant factors to such in different strains.

Alcohol and sex ratios in mice, E. C. MacDowell (*Amer. Nat., 62 (1928), No. 678, pp. 48–54*).—From the results presented in the papers noted above, the author shows that the sex ratios in litters of mice produced by sires or dams treated with alcohol by inhalation or injection were not significantly different from the sex ratios in the control litters.

May the sex of the embryos of mammals be truly influenced? J. Weber (*Lässt sich das Geschlecht des Embryos von Säugern Wirklich Willkürlich Beeinflussen? Inaug. Diss., Univ. Bern, 1927, pp. 34*).—The author gives a brief account of the results of injecting pregnant female rabbits at the tenth to fifteenth day of gestation with paraldehyde. He found among the offspring from these litters at birth 87.5 per cent females and 12.5 per cent males.

FIELD CROPS

[Field crops work at the Holly Springs, Miss., Substation], C. T. AMES and O. B. CASANOVA (*Mississippi Sta. Bul. 253* (*1927*), *pp. 4, 5, 6–17, 19–29, figs. 4*).—Experiments reported on as heretofore (E. S. R., 56, p. 731) included variety trials with cotton on hill and valley land, corn, lespedeza, grain sorghum, sorgo, soy beans, and fodder beets, fertilizer tests with cotton and sweet potatoes, spacing trials with cotton, and an interplanting test of corn with soy beans and velvet beans. Production methods are outlined for the principal crops tested.

Delfos 6102 and 631, Lone Star 65, and D. & P. L. No. 4 were outstanding among the cotton varieties. Fertilizer and spacing recommendations from the test results were in agreement with those previously reported. Trials of nitrogen and potassium carriers and comparisons of mixed fertilizers are also noted briefly. Recommendations for sweet potatoes are from 400 to 800 lbs. per acre of an 8–4–4 fertilizer, and spacings of 14 in. apart in 3- to 3.5-ft. rows.

[Field crops experiments at the Williston, N. Dak., Substation, 1927–28], E. G. SCHOLLANDER (*North Dakota Sta. Bul. 219* (*1928*), *pp. 5–18, 28, figs. 4*).—Experiments reported on for the period April 1, 1927, to March 31, 1928, resuming work recorded earlier (E. S. R., 53, p. 529), embraced varietal trials with common and durum spring wheat, oats, barley, flax, corn, potatoes, alfalfa, millet, field peas, sugar beets, mangels, and carrots, a spacing test with flint corn, tuber unit plantings of potatoes, and crop rotation and crop sequence studies.

A new system for variety test plats, E. J. DELWICHE (*Jour. Amer. Soc. Agron., 20* (*1928*), *No. 7, pp. 771–773, figs. 3*).—The method tested at the substations of the Wisconsin Experiment Station is described and illustrated.

A study of permanent dairy pastures in New Jersey, H. B. SPRAGUE and H. W. REUSZER (*N. J. Dept. Agr. Circ. 141* (*1928*), *pp. 101, figs. 22*).—A detailed survey in cooperation with the New Jersey Experiment Stations covered 104 permanent dairy pastures in southern New Jersey in 1926 and 160 in northern New Jersey in 1927, totaling 4,710 acres. Much information was recorded on pasture characteristics and the effects of natural drainage conditions, soil texture, and cultural treatments.

The total area per farm and the average area devoted to permanent pastures, hay, silage, and soiling crops, respectively, were largest on the glacial soils in northern New Jersey and smallest on river flood plains soils. Pastures of known age surveyed had been in grass continuously for an average of 16 years in southern New Jersey and 20.2 years in northern New Jersey. Forest or scattering tree growth occupied about 13 per cent of all surveyed pastures in northern New Jersey. Inedible shrubs, sedges, and rushes occupied from 6 to 8 per cent of upland soils and from 12 to 25 per cent of lowland soils, and weeds between 15 to 25 per cent of the total area surveyed.

Forage plants occupied 52.6 per cent of the total pasture area in northern New Jersey and 76.7 per cent in southern New Jersey. Kentucky bluegrass comprised 37.2 per cent of all forage plants; redtop, 19.2; white clover, 7.8; timothy, 6.8; poverty grass, 5.7; sweet vernal grass, 4.6; bent grasses, 3; Canada bluegrass, 2.8; orchard grass, 2; edible rushes and sedges, 4.4; unnamed grasses, 5.7; and unnamed legumes, 0.3 per cent. The relative abundance of important weeds or weed groups is given for each soil province with control methods.

Glacial lake and river terrace soils supported the most productive pastures in northern New Jersey and coastal plain soils in southern New Jersey. The average quantity of feed yielded by an acre of grazing land was the equivalent of 2,330 lbs. of alfalfa hay. No consistent relation was noted between the total mineral nutrients in the surface soil and either the total feed produced or the vegetation on the soil.

Poor drainage favored the growth of rushes and sedges and inhibited the forage plants, and weeds were less abundant. Pastures with poor natural drainage were somewhat superior in feed production to well-drained pastures in northern New Jersey and the reverse in southern New Jersey, evidently because of close grazing on wet pastures in the north and fertilizers plus close grazing on well-drained pastures in the south. Poorly drained soils were usually the richer in nitrogen, phosphorus, and carbon. Neither total calcium nor total potassium showed any consistent relation to natural drainage and none of these constituents to feed produced.

Classing gravelly, stony, shaly, and sandy loams as coarse-textured soils and silt loams and loams as fine-textured soils, no uniform relation was apparent between soil texture and average size of pastures, abundance of forest included, and total area occupied by shrubs, rushes, and sedges. Forage plants were most abundant on the fine-textured soils of every province. There was no uniform superiority in feed produced by pastures on either coarse or fine-textured soils, and for the State as a whole no marked correlation existed between total mineral nutrients in the surface soil and soil texture.

Reseeding was seldom practiced and was not reported advantageous. Mowing (on the northern pastures), continuous grazing, early spring grazing, and treatments (in southern New Jersey) with fertilizer, manure, and lime decreased the proportion of sedges. rushes, shrubs, and weeds and increased that of forage plants. Mowing increased feed production over not mowing 12.5 per cent, continuous grazing over period grazing 42.7 per cent, and soil treatments 17 per cent over untreated pasture. Coastal plain pastures grazed before May 2 produced 2,736 feed units per acre during the season, first grazed between May 2 and 14 produced 1,148 units, and first grazed after May 14, 1,072 units. The characteristics of the 48 best pastures are described briefly.

An analytical study of the putting greens of Rhode Island golf courses, B. E. Gilbert (*Rhode Island Sta. Bul. 212 (1928), pp. 15*).—Observations on green keeping practices on Rhode Island golf courses are summarized, and analyses of soils from putting greens on 22 courses are tabulated.

Bent grasses predominated in the seeding mixtures, and 9 courses were seeded with bent grasses alone. Ammonium sulfate was in common use, and where used consistently high acidity conditions were present in the soil, and in some cases indications of suppression of weed growth were noted.

No positive relation was observed between fineness of soil and good turf. The practice of top-dressing with sand caused dilution of the soils such that the active-alumina content was affected. An inverse relation was found between the finer portions of the soil and the active alumina. Courses with the best turf on their greens were highest in total nitrogen and also in estimated humus. The relative needs of the soils for phosphoric acid, as measured by the growth in pots of Macomber turnips, suggested that benefit might be had in many cases from the addition of superphosphate (acid phosphate).

[Root crops experiments in Canada], F. T. Shutt (*Canada Expt. Farms, Div. Chem. Rpt. 1927, pp. 30–34*).—Additional analyses are reported on sugar beets, mangels, carrots, and turnips, supplementing those noted earlier (E. S. R., 59, p. 432).

Influences which tend to affect seed production in alfalfa and an attempt to raise a high seed-producing strain by hybridization, W. SOUTHWORTH (*Sci. Agr., 9 (1928), No. 1, pp. 1–39, figs. 21*).—Review of other studies suggested that failure to obtain a properly balanced supply of soil and atmospheric moisture is the real cause of alfalfa flowers failing to set seed. Pollination studies at the Manitoba Agricultural College and elsewhere showed that if alfalfa flowers are not tripped naturally, chiefly by wild bees, or by hand tripping, only a small percentage produce seed pods. Seasonal variability in seed setting in plants was also observed.

Selection up to the F_7 generation in a cross between alfalfa and black medick (*Medicago lupulina*) has produced a hybrid alfalfa in which a varying percentage of the plants have flowers practically entirely self-tripping but largely sterile and also plants partially self-tripping and partially fertile. Since sterility appears to be gradually giving place to fertility in recent generations, it is hoped that eventually a strain will be evolved having flowers perfectly self-tripping and also possessing a high degree of fertility.

Factors affecting the germination and growth of chamiza (Atriplex canescens), C. P. WILSON (*New Mexico Sta. Bul. 169 (1928), pp. 29, figs. 10*).—Germination and growth studies with chamiza (E. S. R., 55, p. 433) at the station and in its vicinity showed that the presence of calcium carbonate at or near the soil surface favors the growth of the young seedlings. While germination took place on noncalcareous soil on the range, the seedlings died while small. With favorable conditions good stands were made in numerous plantings on range land supplied with calcium carbonate.

Plat tests indicate planting the seed before September 1, although under favorable conditions good stands may result from plantings up to February 1. Depths of from 1 to 1¼ in. seemed enough on sandy loam or gravelly sandy loam soils, and shallower if the soil is inclined to bake.

Comments are also made on injury by rabbits, mice, and other animals, planting methods, and gathering and planting the seed, and a note by H. V. Jordan (pp. 17–19) discusses the soil requirements of the plant.

The proper binomial or varietal trinomial for American mammoth red clover, A. J. PIETERS (*Jour. Amer. Soc. Agron., 20 (1928), No. 7, pp. 686–702*).—An extensive review led the author to conclude that a correct Latin trinomial for mammoth red clover does not exist and that there is no reason for the use of such a trinomial in agronomic literature. Botanically, mammoth clover may be grouped with other late-flowering, single-cut forms under *Trifolium pratense serotinum*. The name *T. medium* evidently should not be used for mammoth clover.

The effect of interplanted legumes on the yields of corn, C. K. MCCLELLAND (*Arkansas Sta. Bul. 229 (1928), pp. 19*).—Soy beans, cowpeas, velvet beans, and mung beans were seeded at several rates and dates in corn in both normal and wide rows in tests at the station and substations.

Spacing trials indicated that in most cases lower corn yields result when the stand falls below the normal planting rate because of wider rows. The yield from wide row plantings averaged from 82 to 83 per cent of the normal yield.

Corn in wide rows with or without legumes averaged about 80 per cent or less of the normal production in narrow rows without legumes, most of the reduction being due to reduced stand and generally a slight decrease due to legume growth. In narrow rows, evidently because of full stands of corn and preoccupation of the soil, the legumes planted late reduced the corn crop only about 4 or 5 per cent. With legumes sown at different rates in the corn row, corn yields generally decreased as the number of hills of legumes increased. It was observed that legumes planted in corn at the usual rates will reduce corn yields to 75 to 80 per cent of the normal yield without legumes, whereas a decrease of about only 4 or 5 per cent of the corn yield results if the planting of legumes in the row or in the middle be delayed. Corn yields were higher with legumes drilled in the middle than with broadcasted legumes.

Consideration of all data showed that corn yields may be reduced by planting legumes early or in wide rows, whereas only slight reduction occurs in normal rows and when legumes are planted late.

The toughness of cotton bolls in relation to age and nutrient supply as measured by pressure tests, G. M. Armstrong (*Jour. Agr. Research* [U. S.] *36* (*1928*), *No. 12, pp. 1011–1025, figs. 7*).—Pressure tests involving the resistance to needle puncture were made during 1924, 1925, and 1926 at the South Carolina Pee Dee Substation on bolls of several ages from different cotton varieties grown under two conditions of soil fertility.

Toughness of boll wall increased until about 21 days when the bolls were practically full sized, and after this time age of boll was not important. Toughness of wall also seemed to be influenced by conditions during the developmental period, extremes of soil fertility conditions, and variety. Neither resistance to puncture, wall thickness, nor boll size were found to be closely correlated with the percentage of cotton loss from boll weevil attack.

Variability in staple length of some commercial varieties of cotton, H. E. Rea (*Jour. Amer. Soc. Agron., 20* (*1928*), *No. 7, pp. 703–709*).—Studies at the Temple, Tex., Substation on the lint of 16 varieties of cotton commonly grown in the State showed that most commercial cottons possess a high degree of variability in staple length. Certain varieties were consistently uniform as to staple length, even under widely contrasting climatic conditions, while other sorts consistently exhibited a high degree of variation. Some varieties showing considerable variation in length of staple in 1925 were relatively uniform in 1926, and the reverse was also true. Widely different seasonal conditions in the two years seemed to have no consistent effect on the variability in length of staple of the different varieties.

Cotton in Mozambique, J. A. Evans (*O Algodão em Mocambique. Lourenco Marques: Colón. Moçambique Dir. Serv. Agr., 1928, pp. 44, pls. 8; Eng. trans., pp. 25–44*).—Potential cotton districts, climate, planting periods, labor supply, and insect pests and diseases attacking cotton are described from a recent survey in Portuguese East Africa. While the colony as a whole is considered marginal and submarginal cotton territory, in certain areas in each district cotton might be grown in rotation with other crops with fair success if the best insect control methods are used.

Fertilizers for fiber flax, W. L. Powers (*Jour. Amer. Soc. Agron., 20* (*1928*), *No. 7, pp. 755–763, figs. 4*).—Fertilizer tests with fiber flax in field plats and in cultures at the Oregon Experiment Station showed that maximum yields followed the use of potassium in conjunction with nitrate, and this combination also produced flax of good quality and strength and of superior length. Potassium nitrate surpassed other potassium salts in flax production in cultures. The potassium salts seemed to make the flax plants less liable to wilt, and potassium appeared to be especially important early in the growth period of flax. Supplemental irrigation increased the length of fiber flax 20 cm. and the yield more than 50 per cent. It is indicated that early planting and providing uniform moisture and nutrient supply, with the aid of supplemental irrigation in western Oregon, tends to delay the maturity and increases the length and value of fiber flax.

The Jerusalem artichoke (Helianthus tuberosus), J. B. Munro (*Brit. Columbia Dept. Agr., Field Crop Circ. 6 (1928), pp. 8*).—Cultural methods and field practices are outlined for the crop in British Columbia.

Effect of size of seed set on yield and on certain other characters in potatoes, D. C. Tingey and G. Stewart (*Jour. Amer. Soc. Agron., 20 (1928), No. 7, pp. 710–721*).—Comparative tests during the period 1923–1927 at the Utah Experiment Station using sets of whole, halved, and quartered 4-oz. and 8-oz. Rural tubers and also 1-oz. pieces from 8-oz. tubers demonstrated that the same size set from either 8-oz. or 4-oz. tubers does not materially affect the yield. Considering total net yields the 4-oz. whole set, the 8-oz. quartered, the 8-oz. whole, and the 4-oz. half were high, it appearing doubtful if any one of these four surpasses any other. For net marketable yields the ranking of sets from the 8-oz. group favored the 8-oz. tuber quartered. From the 4-oz. tubers the whole and halved sets led with the same average ranking.

Measurements on other characters showed that as the size of set increased the average height of vine, the number of stems and tubers per hill, and the weight to the hill increased, whereas the percentage of marketable tubers, the weight per tuber, and the number of tubers per stem decreased.

Fertilizer studies with early potatoes, G. V. C. Houghland (*Soil Sci., 26 (1928), No. 3, pp. 199–215, pl. 1*).—Fertilizer tests were made with Irish Cobbler potatoes on Norfolk sandy loam at Snow Hill, Md., under the auspices of the University of Maryland.

Comparison of different nitrogen forms in a 7–6–5 (N–P–K) fertilizer mixture indicated that part of the nitrogen should be derived from organic sources. Leunasalpeter compared favorably with sodium nitrate and ammonium sulfate as an inorganic nitrogen source, although the mechanical condition of the fertilizer mixture was very bad. Potato yields on a sand hill were increased where a green manure cover of rye and vetch was grown the preceding winter and early spring. Deferring the application of the soluble mineral portion of the fertilizer mixture until the first cultivation was followed by reduced yields. Applications of potassium seemed necessary for maximum yields on the soil, and either potassium sulfate or chloride appeared preferable to manure salts on the basis of equivalent quantities of potassium in a complete mixture. Double strength fertilizers applied 1,000 lbs. per acre compared favorably with the regular 7–6–5 mixtures at 2,000 lbs. per acre.

Studies on rice in Sind, Part I, K. I. Thadani and H. V. Durga Dutt (*India Dept. Agr. Mem., Bot. Ser., 15 (1928), No. 6, pp. 109–159, pls. 5, fig. 1*).—Thirty-five of the varieties of rice cultivated in Sind are classified and described, with detailed notes on important morphological, agronomic, and physiological characters. Other phases dealt with include quality, flowering, pollination, sterility, and improvement work in Sind rices, and the acclimatization of exotic rices.

Soybean inoculation studies, L. W. Erdman and F. S. Wilkins (*Iowa Sta. Research Bul. 114 (1928), pp. 56*).—Inoculation experiments with soy beans included studies of the efficiency of several commercial cultures and of the value of inoculated soil applied in different ways to the seed and soil.

Comparisons showed that while all of the different methods of applying inoculated soil produced inoculation, the soil paste method, either with water or milk, gave the most consistent results. The efficiency of soil inoculation applied to soy bean seeds appeared proportional to the quantity of soil adhering. Direct sunlight did not seem to lower the efficiency of soil inoculation when soil is applied to the seeds or broadcast. Storage of inoculated seed for from 2 to 4 days was evidently without harmful effects. Neither lime nor lime and superphosphate (acid phosphate) affected inoculation in the foregoing tests. The sugar in the inoculum for the soil paste method had some effect in increasing the degree of nodulation. Differences were not apparent from different rates of drying the seed inoculated by the soil paste method. Planting dry and moist seed in dry and moist soil inoculated and uninoculated showed that while differences were not great the best inoculation will generally be had when the moist inoculated soy beans are planted in moist soil. Varietal differences were noted in the response to soil inoculation.

With Black Eyebrow soy beans good inoculation came from the sugar solution method but not as satisfactory as from broadcast soil. Two of four commercial cultures were much less effective than the other two. Lime alone or with superphosphate was not very effective in this test. Cross inoculation tests with soil from around the roots of four varieties showed that while usually best results may be had when soil from the same variety is used it is not necessary for satisfactory inoculation. Pure cultures isolated from different varieties of soy beans also differed markedly in their relative efficiency to produce nodulation on different varieties. Lime and superphosphate tended to increase the inoculation of Manchu soy beans and inoculation plus these treatments to increase crop yields noticeably.

Compost soil made by composting alternate layers of soy bean roots with soil from fall to spring was more efficient in soil paste than inoculated soil from the same field or than the sugar solution method, although all three were surpassed by the soil broadcast method. The degree of inoculation and yields rose with the increase in soil paste from 0.5 to 4 pints of soil per bushel of seed, the compost excelling ordinary inoculated soil. Fresh soil produced slightly better inoculation by the soil paste method than the dry pulverized soil.

Trials in 1925 of different commercial cultures on three varieties showed that some cultures are better adapted to one variety of soy beans than to others, that cultures vary widely in inoculating efficiency, and that those direct from the factory were apt to be more efficient than the same brand from a dealer, although this superiority was not apparent in the 1926 tests.

Lime alone or with superphosphate did not affect inoculation much on Manchu seed treated with compost paste, and neither resulted in appreciable increases in soy bean hay yields. In the case of Manchu plants from plats inoculated with commercial cultures, lime alone and with superphosphate caused some increases in the weights of plant tops and roots over untreated plants. The percentage of nitrogen in both tops and roots increased with the degree of inoculation. Lime increased the percentage of nitrogen in both the tops and roots of the plants, whereas superphosphate had no effect.

Sugar beet and beet sugar, R. N. Dowling (*London: Ernest Benn, 1928, pp. X+5–277, [pls. 24], figs. [23]*).—A review of the history and status of the sugar beet industry in Great Britain and in the world is followed by information on the seed and its production, plant characteristics, beet production practices, implements, insect pests and diseases, and by-products of the industry. The process of sugar manufacture is outlined briefly.

The technique of cane fertilizer experiments, C. H. B. Williams (*Facts About Sugar, 23 (1928), No. 37, pp. 879, 880*).—The methods employed at the experiment station of Guadeloupe are outlined.

Field experiments with fertilisers on sugar cane in Jamaica, H. H. Cousins (*Jamaica Dept. Agr. Ann. Rpt. 1927, pp. 9–13*).—Cooperative fertilizer trials on plantations during the 25 years since 1901 showed 0.5 ton of slaked lime per acre every third year to be profitable on many soils. Benefits also followed the application of ground limestone. With proper growth conditions from 100 to 300 lbs. of sodium nitrate or ammonium sulfate were generally profitable. In some cases associated with calcium deficiency, sodium nitrate was effective and ammonium sulfate not, although the latter appeared to be the best nitrogen carrier on most soils. Good results from basic slag where other phosphorus carriers were not effective seemed due to its lime content. Special cane fertilizers were often inferior to and cost more than a suitable mixture, such as ammonium sulfate two parts and potassium sulfate one part. Potassium was needed on some soils and gave no return on others, but in general from 0 5 to 1 cwt. of potassium sulfate per acre is indicated in addition to the nitrogenous fertilizer. Tillage and drainage are held of more importance to the crop than fertilizer applications.

The Indian types of Lathyrus sativus L. (khesari, lakh, lang, teora), G. L. C. Howard and K. S. Abdur Rahman Khan (*India Dept. Agr. Mem., Bot. Ser., 15 (1928), No. 2, pp. 49–77, pls. 3, fig. 1*).—Certain characteristics of the chickling vetch, including the root range, flowering, pollination, cross-fertilization, and lathyrism are discussed briefly, and 56 unit species isolated from bazaar samples are described and grouped into 3 varieties in a determinative key.

Colorado wheat varieties, A. Kezer, F. A. Coffman, D. W. Robertson, D. Koonce, and G. W. Deming (*Colorado Sta. Bul. 329 (1928), pp. 55, figs. 9*).—Varietal trials over extended periods with winter and spring wheat at the station and Fort Lewis and in cooperation with the U. S. Department of Agriculture at Akron (E. S. R., 52, p. 827) are described in detail, together with the results of milling and baking tests. Cultural methods for wheat under irrigation and dry land conditions are outlined, producing areas are indicated, and wheat production in Colorado is reviewed briefly.

Recommendations were for conditions similar to those at Fort Collins under irrigation Kanred and Turkey winter and Marquis spring wheat; for conditions similar to those at Akron on dry land Kanred and Turkey winter wheat, Converse (Red Russian) hard red spring wheat, and Akrona, Kubanka, and Peliss durum; and for conditions similar to those at Fort Lewis, i. e., altitude over 7,000 ft. and irrigation, Kanred winter wheat, and Defiance, Preston, Kitchener, and Marquis spring wheat. Kanred and Turkey seemed to be about equal in milling and baking qualities.

Results at Akron indicated that fallowing for wheat probably is not justified, since the average yields on fallow for all types of wheat usually did not surpass those on land cropped previously to corn enough to justify the additional expense. Seeding on corn land usually hastened maturity and produced shorter straw and smaller yields of both straw and grain than seeding on fallow. While spring wheat should be seeded as early in the spring as soil conditions permit, its culture is not recommended for the dry lands, except possibly as a catch crop where a feed crop is not desired. Winter wheat sown as late as October 15 usually will outyield spring wheat.

Absorption of moisture by stored grain in the arid Southwest, S. P. Clark (*Arizona Sta. Timely Hints for Farmers, No. 159 (1928), pp. 8, figs. 7*).—The variations in weight are shown for barley, oats, and wheat grown under irrigation and stored in sacks in a grain bin from July to May or June. Average increases in weight for the year ranged from less than 0.5 per cent to nearly 2.5 per cent, with considerable differences between varieties of the same cereal. The increase in weight seemed to vary with climatic conditions, being favored by low temperatures and incidence of rainfall.

Report of seed analyses, 1927, E. M. Gress and M. C. Mowry (*Penn. Dept. Agr. Bul. 455 (1928), pp. 40*).—The purity, germination, and weed-seed content are tabulated for 480 samples of agricultural seed collected during 1926.

The akenes of some Compositae, A. M. BLAKE (*North Dakota Sta. Bul. 218 (1928), pp. 19, figs. 40*).—The akenes or seedlike fruits of sunflowers and their allies are described and illustrated for 38 species. Brief statements of the importance, distribution, and occurrence of its akenes in crop seeds are given for each species by O. A. Stevens.

Experiments on the eradication of Canada thistle, Cirsium arvense, with chlorates and other herbicides, A. ÅSLANDER (*Jour. Agr. Research [U. S.], 36 (1928), No. 11, pp. 915–934, figs. 4*).—Further studies (E. S. R., 57, p. 135) at the New York Cornell Experiment Station were concerned with the merits of herbicides in the eradication of Canada thistle and their effects on the soil.

Application of 200 kg. per hectare (178 lbs. per acre) of sodium chlorate or 250 kg. of potassium chlorate as dry salt on the land late in autumn killed Canada thistle roots during the winter, whereas an early spring application was less effective. Such fall application of sodium chlorate killed the Canada thistles and did not injure oats sown on the plats the next spring. Sodium thiocyanate, sodium cyanide, and sodium arsenite had practically no effect on Canada thistle under field conditions.

The effectiveness of chlorates seemed due to their rapid penetration through soil and slow decomposition, especially at low temperatures. Sodium thiocyanate, and to a greater extent sodium cyanide, decomposed so rapidly in the soil that Canada thistle under field conditions was not harmed. Sodium cyanide did not seem to penetrate the soil under field conditions, and sodium arsenite was ineffective because it penetrated the soil very slowly. Application of herbicides in the autumn had no apparent influence on the ammonification and nitrification processes in the soil the following spring.

HORTICULTURE

Garden and orchard, E. G. SCHOLLANDER (*North Dakota Sta. Bul. 219 (1928), pp. 18–23, figs. 4*).—Of five tomatoes, Jumbo Chief, Red River, North Dakota Earliana, Millet Dakota, and Agassiz, the North Dakota Earliana and Red River were the most productive and yielded the most early ripe fruits. Copenhagen Market cabbage yielded mature heads sooner than did the Golden Acre, but the heads of the latter were larger. Five varieties of cauliflowers, Suhr Late, Suhr Medium, Suhr Early, Suhr Earliest, and Perfection, ripened their first heads in the order given.

North American orchards, W. H. CHANDLER (*Philadelphia: Lea & Febiger, 1928, pp. 516, figs. 80*).—A comprehensive treatise on pomology, setting forth modern commercial practices and accompanying this wherever possible by a discussion of the underlying principles that have been determined by scientific investigation.

Progress report on fruit breeding, G. T. SPINKS (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1927, pp. 27–31*).—Observations on the fruit of seedling apples, pollen parent unknown, showed a consistent resemblance to the known parent in the case of Bismarck, Lord Derby, and King of Pippins seedlings, but in the case of about 40 seedlings of Cox Orange Pippin there was a great diversity in size, shape, color, and flavor, with few bearing any resemblance to the Cox Orange Pippin. Information respecting the breeding value of various apples was obtained, and certain seedlings were retained for propagation. The McIntosh was crossed with Worcester Pearmain, Cox Orange Pippin, and James Grieve.

Progress was noted in the breeding of plums, pears, black currants, and other small fruits. One pear seedling Bartlett (William Bon Chretien) × Conference.

ripening in October, proved to be of first-class dessert quality. An attempt was made to breed strawberries resistant to aphids.

The possibility of producing fruit tree stocks in the southern United States, J. A. McClintock (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 132–134*).—In view of the impending quarantine on European rootstocks and with the knowledge that good peach and cherry stocks have been grown in Tennessee, the author successfully grew plums, cherries, apples, and pears, arriving at the conclusion that satisfactory nursery propagation of these stocks is possible in the Southern States.

Various experiments with a view to the control of lime-induced chlorosis in apple and plum trees (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1927, p. 194*).—A brief progress note reporting that the treatment of lime-induced chlorosis with sulfate of iron either by broadcasting on the soil, injection into the tree, or spraying of the foliage was of no commercial value, since the beneficial results were temporary and sometimes followed by injury. Very promising results were secured in large scale experiments following the simple expedient of sowing clover mixtures, lucerne, and tumble down grass on the affected areas.

Some observations on ringing fruit trees to increase production, T. Swarbrick (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1927, pp. 50–55, pl. 1*).—Discussing the principles of ringing, the author reports upon the results of studies at the Long Ashton Research Station in which it was found that the latter half of May is the most favorable time for ringing apple trees. Ringing almost invariably proved fatal to stone fruits. Knife edge ringing gave inconsistent results, probably because of too rapid healing. In addition to stimulating flower bud formation ringing almost invariably caused extensive shoot development below the wound. Rings slow in healing were benefited by paring the callus and covering to reduce evaporation.

Apple breeding: A study of Jonathan crosses, H. L. Lantz (*Iowa Sta. Research Bul. 116 (1928), pp. 121–160, figs. 13*).—A study of seedlings resulting from crosses of 11 apple varieties, Salome, Colorado Orange, Anisim, Roman Stem, Wealthy, Patten No. 20, Winesap, Walbridge, Black Ben Davis, Delicious, and Sheriff, with Jonathan showed great variability, which is attributed to differences in the genetic constitution of the several parents and indicates the value of these parental varieties for breeding with Jonathan.

Observations on trees of the Salome, Colorado Orange, Anisim, and Roman Stem progenies, each represented by not less than 30 trees, showed Colorado Orange to lead in the transmission of vigor to the progeny and Roman Stem to be poorest in this respect. Relative to the size of the fruits of seedlings, Colorado Orange was the most potent parent, followed in order by Salome, Roman Stem, and Anisim. The Salome cross produced the largest proportion of seedlings, with fruits rating good and very good, followed in order by Colorado Orange, Anisim, and Roman Stem. The Salome cross also yielded the largest percentage of sweet apples. As regards season of ripening, that of the progenies conformed quite generally to that of the parents. Anisim, a summer apple, produced the highest percentage of early apples, while Salome and Colorado Orange, winter varieties, produced a high percentage of late ripening seedlings.

Color in the parents was indicative of color in the progeny. Anisim and Wealthy crosses yielded a conspicuous number of attractive red seedlings. Winesap, however, failed to transmit its color. Flesh texture in the seedlings also tended to conform with that of the parents. Taking all flesh characters into consideration the Salome×Jonathan cross produced the largest percentage of desirable seedlings. Variability in characters was such as to suggest that their inheritance is largely governed by multiple factors. The color, size, and flavor of Jonathan were occasionally recovered in the seedlings in combination with characters of the other parent. The probable genetic make-up of Jonathan is discussed.

Some preliminary observations upon the influence of scion variety upon the root growth of young apple trees, T. SWARBRICK (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1927, pp. 42–49, pls. 3*).—Data presented in a previous paper (E. S. R., 58 p. 139) are again discussed from the viewpoint of their bearing on the English rootstock problems.

Factors governing fruit bud formation.—VIII, The seasonal elongation growth of apple varieties on some vegetative rootstocks and its possible relation to fruit bud formation, T. SWARBRICK (*Jour. Pomol. and Hort. Sci., 7 (1928), No. 1–2, pp. 100–129, figs. 12*).—Knowing that certain rootstocks markedly increased the number of fruit buds formed in the early life of the tree, an attempt was made at the Long Ashton Research Station to correlate this precocity with differences in seasonal growth as influenced by the rootstock. Study of records accumulated over a series of years upon trees of several varieties growing on clonal rootstocks suggested that precocity in fruit bud formation is a result of an early slowing down and early cessation of shoot elongation. Trees grafted on Type IX, a weak growing stock, ceased growth almost 3 weeks earlier than did the same varieties worked on other stocks. With trees growing under normal conditions the desirability of inducing an early cessation of growth by the growing of cover crops is suggested. A carbohydrate-nitrogen ratio favorable to fruit bud formation is apparently promoted by the early cessation of growth. Under the conditions of the experiment, trees of a single variety began growth practically the same time on the various stocks. The total growth of the season was determined by a decline in the growth rate in early summer rather than by a difference in the spring start.

An analysis of the effects of potash fertilizers on apple trees at East Malling, N. H. GRUBB (*Jour. Pomol. and Hört. Sci., 7 (1928), No. 1–2, pp. 32–59, pls. 6, fig. 1*).—The application of sulfate of potash to apple trees growing at the East Malling Research Station, England, gave decidedly beneficial results. There was a great decrease in leaf scorch, an increase in yields and the size of fruits, and increased vegetative growth. However, there was noted in a few cases a temporary reduction in yield on the potash plats, a condition believed associated with an over-vegetative condition of the trees. Some tendency was observed toward less color in the fruit, especially in the vegetative trees. Potash apparently increased the set of fruit in some cases and also temporarily induced earlier ripening. The net returns from the potash treated trees showed a marked increase.

Catalase as an indication of fruit tree response to soil treatment, J. E. KNOTT and R. D. ANTHONY (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 188–190*).—Determinations upon the buds of 19-year-old Stayman Winesap trees suggested that blossom buds have a much greater catalase activity than do vegetative buds, at least during the fall and the early winter. Little difference was noted in the catalase activity of blossom buds from trees of contrasting vigor, nor was activity correlated with the size of buds. Differences of from 10 to 20 per cent were observed between buds of similar type from the same tree. Catalase activity of vegetative buds varied widely in trees of different vigor and was greater in the more vigorous trees, indicating that measurements of catalase activity may be used as an indication of the response of fruit trees to treatments.

Effect of acid wash on the keeping qualities of apples, F. M. Green (*Colorado Sta. Bul. 343 (1928), pp. 18, figs. 4*).—Experiments conducted in 1927 with apples of several varieties failed to show that washing fruit in weak hydrochloric acid solution had any deleterious effect on keeping qualities. The addition of formaldehyde to the acid solution neither prevented nor decreased subsequent decay. No difficulty was obtained in reducing the arsenical residue below the 0.01 grain of arsenious oxide to 1 lb. of fruit tolerance. A cold wash made up of 32 lbs. of common salt and 32 lbs. of sal soda in 100 gal. of water was only 50 per cent as efficient as the acid solution and like the acid has no effect on keeping quality. Washing could not be associated with physiological troubles such as internal breakdown, scald, and shriveling, nor was it possible to distinguish by taste, sight, or touch between washed and unwashed fruit. Packing apples when slightly moist did not cause or increase decay when the fruit was stored under ventilation and at low temperatures.

The specifications are given for a practical homemade washing machine, and recommendations are made as to the best practices to be employed in washing fruit. It is pointed out that poor results are due to overripe fruit, rough handling, contamination of the acid solution from decayed fruit, delays in washing, failure to rinse thoroughly and to change the solution, and failure to store promptly and under good conditions.

The loss of nitrogen from pear leaves associated with natural defoliation, F. B. Lincoln (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 207–209, fig. 1*).—Having shown in an earlier paper (E. S. R., 58, p. 236) that the foliage of young Bartlett pears at the height of foliation contains more nitrogen than is in the woody part of the tree, the author determined the nitrogen content of Bartlett pear leaves gathered at frequent intervals from July 19 to December 19. The basal leaves lost, respectively, 38, 37, and 33 per cent of their nitrogen as related to area, dry weight, and fresh weight. Terminal leaves lost 35.2 per cent of nitrogen in relation to area and 35.8 per cent on a dry weight basis. Since water-soluble nitrogen and moisture increased toward the end of the season, there was no question that lack of translocation was due to insolubility. Immaturity was not a factor, since the leaves did not fall until late December.

The comparatively low movement of nitrogen from the foliage to the tree is believed to be due to an abundance of nitrogen within the tree proper. It is suggested that the higher the nitrogen content of the tree the lower the movement from the leaves to the tree prior to defoliation. It is suggested also that nitrogen content of the leaves may serve as an index to the nitrogen content within the tree, and that defoliation may possibly be used as a means of controlling the carbohydrate nitrogen ratio.

Relation of the time of thinning peaches to the growth of fruit and tree, M. J. Dorsey and R. L. McMunn (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 221–228, fig. 1*).—A further report (E. S. R., 58, p. 236) upon peach thinning experiments conducted by the Illinois Experiment Station.

Thinning was found to have little effect on the size of the fruits up to the beginning of the final period of enlargement. Measured in terms of weight or volume there were noted three distinct stages in the growth of peach fruits, a period of rapid growth, a rest period, and the final enlargement. Comparing growth of fruits and of shoots, it was evident that the shoots made a rapid and fairly uniform gain in length during the first period and accelerated growth during the rest period with a gradual decline during the enlargement period. No measurable acceleration in twig growth was detected following fruit thinning. The authors again set forth the suggestion that the time of effective thinning in the peach may be extended beyond that now in practice.

Plum rootstocks: Their varieties, propagation, and influence upon cultivated varieties worked thereon, R. G. Hatton, J. Amos, and A. W. Witt (*Jour. Pomol. and Hort. Sci., 7 (1928), No. 1–2, pp. 63–99, pls. 6*).—Discussing rootstocks and their propagation the authors point out various interrelationships between stock and scion. In the East Malling Research Station nursery certain combinations of stock and scion invariably gave poor results suggestive of actual incompatibility. The Pershore, the Common Mussel, the Brompton, and certain well selected Myrobolan stocks gave consistent satisfaction; for example, the average success of Czar buds on Myrobolan and Brompton roots for the 7 years 1919 to 1926 was 89+ and 82+ per cents and on the Brussel only 24 per cent. As evidence of the effect of rootstocks on top growth, Victoria plums on Myrobolan made practically double the growth of Victoria on Brussel during the first 5 years. In respect to vigor, as indicated by height, spread of the tree, and trunk girth, the Myrobolan. Brompton, and Pershore stocks were very vigorous. Weights of 2-year-old Czar trees grafted on the various stocks gave further evidence of the superiority of certain stocks. Habit of growth of the scion was affected by the rootstock. Varieties on Myrobolan and Brompton roots produced more and larger lateral growth.

The development of root suckers appeared to be a varietal characteristic rather than due to the method of propagation. Common Mussel, Common Plum, and Brussel were conspicuously prolific in sucker growth. The scion variety exerted an influence on the number of suckers. Brompton and Common Mussel were exceptionally strong rooted, while Brussel and Pershore trees were easily blown over in wind storms.

Rootstocks influenced the time of blooming of the scion, but there was no correlation between time of blooming of the stock and its effect on the scion; for example, the late blooming Pershore apparently accelerated the time of flowering of the scion. Rootstocks influenced the proportion of blooming and nonblooming spurs on young trees. The actual number of flowers to the spu was also affected; for example. Victoria on Common Mussel, Pershore, Brussel. and Myrobolan averaged 7.3, 6.7, 4.7, and 3.2 flowers per spur, respectively. Preliminary fruiting records taken on 10 varieties showed rootstocks to have a significant influence. In seven of the varieties, trees on Pershore yielded the heaviest crop.

Detailed records and a statistical analysis by T. N. Hoblyn are appended.

Fig breeding, I. J. Condit (*Jour. Heredity, 19 (1928), No. 9, pp. 417–424, figs. 3*).—A review of fig breeding operations in the Old and New Worlds, pointing out the numerous unsuccessful attempts to develop better varieties of parthenocarpic figs in the southern United States.

Considerable progress has been made in California in the breeding of improved varieties of caprifigs, with no great advance in edible figs, the leading varieties now grown in California, Calimyrna, Adriatic, Mission, and Kadota, all being of Old World origin.

The effects of manurial treatments on the chemical composition of gooseberry bushes.—I, Effects on dry matter, ash, and ash constituents of leaves and stems of terminal shoots and of fruits, and on total nitrogen of fruits, T. Wallace (*Jour. Pomol. and Hort. Sci., 7 (1928), No. 1–2, pp. 130–145*).—Chemical analyses of the leaves, stems, and berries of gooseberry plants grown under differential fertilizer treatments showed that a deficiency in potash is clearly evident in the composition of the ash of the leaves and stems and less so in the berries. A deficiency of potash was associated with higher dry matter in the leaves and stems, with a lower percentage of ash in the dry matter of the stems and berries, and with higher percentages of CaO, MgO, Na_2O, and P_2O_5 in the ash of the leaves, stems, and berries. Potash deficiency tended to mask low supplies of nitrogen or phosphorus when an attempt was made to determine the content of the phosphorus in the leaves, stems, and berries or of nitrogen in the berries.

The tropical crops, O. W. BARRETT (*New York: Macmillan Co., 1928, pp. XVIII+445, pls. 24*).—A general discussion upon tropical and subtropical crops, their culture, botanical relationships, economic importance, methods of handling, etc.

Studies in the shedding of mango flowers and fruits, Part I, P. V. WAGLE (*India Dept. Agr. Mem., Bot. Ser., 15 (1928), No. 8, pp. 218–249, pls. 5*).—Studies at Ratnagiri, the center of the most important mango producing area in the Bombay Presidency, showed that the proportion of perfect flowers to male flowers is generally small and extremely variable. An examination of 73 clusters of the Alphonso mango in the 1925-26 season showed a range of from 2 to 53 per cent of perfect blooms. Of 319 clusters examined in 1926–27 the range was from 0 to 30 per cent of perfect blooms. Records showed a normal loss of perfect flowers amounting to over 99 per cent. Of the various causes of this extremely low set of blooms the jassid hopper and the mango flower mildew were evidently important factors, but the presence or absence of rain or dew apparently had little significant influence. Attempts to control hoppers with fish oil soap sprays were not entirely successful because of the almost immediate reinfestation. Spraying treatment for mildew was reduced in effectiveness by the fact that the disease attacked the youngest tissues.

Notes on some sterilities in gladiolus flowers, F. T. MCLEAN (*Gladiolus Rev., 5 (1928), No. 9, pp. 303, 304, fig. 1*).—Of several types of sterility occurring in the gladiolus two, one in which the pollen and the ovules are abortive and the other in which the pollen and ovules are apparently perfect but incapable of self-fertilization and cross-pollination with certain other varieties, were studied at the Rhode Island Experiment Station. One variety, Nanus, proved completely self- and cross-sterile, failing both as a pollen and as an ovule parent. The large-flowered garden forms were generally self-sterile and the primulinus hybrids generally self-fertile.

The rural cemetery, C. P. HALLIGAN and H. K. MENHINICK (*Michigan Sta. Spec. Bul. 175 (1928), pp. 36, figs. 18*).—Presenting the results of a survey of rural cemeteries in which it was found that cemeteries were altogether too numerous in the rural districts and often seriously neglected because of the lack of financial support and of endowed perpetual care, the authors offer recommendations for the betterment of conditions, including the consolidation of small cemeteries, improvement of the grounds with attractive plantings and drives, and the adoption of uniform rules and regulations, a set of which is offered. Appended is a copy of the State laws pertaining to rural cemeteries.

FORESTRY

Lake States Forest Experiment Station, St. Paul, Minn., report to the advisory committee, 1927 (*U. S. Dept. Agr., Forest Serv., [1928], pp. [3]+32, pls. 4*).—Studies in the vast aspen forests of the northern Lake States showed that present utilization is much below the annual increment, and in view of the comparatively short life of the aspen large losses seem destined to occur in the future. Natural conversion to better species such as balsam fir, white pine, and white and black spruce is taking place on from 10 to 20 per cent of the aspen area. Artificial seeding was rendered useless by the depredation of the various rodents, which even destroyed young planted stock. It is suggested that more rapid utilization of the aspen is advisable. The growth rates of jack, white, black, and red oaks, which occur on the scrub oak lands of Michigan, were found so nearly comparable that a single volume table was prepared for all these species.

Studies of the fertilizing value of pine needles showed a nitrogen content in one year's accumulation of approximately 15 lbs. per acre. The accumulation in unburned forests, usually containing from three to four years' litter, represents from 45 to 60 lbs. of nitrogen valued at from $9 to $13 in the form of sodium nitrate. In respect to seasonal distribution of litter fall it was found that the accumulation during the four months ended the middle of October was as great and with some species much greater than that which fell during the eight subsequent months. Thus the period of greatest needle fall coincided with that in which deciduous trees shed their leaves. It was found that a unit weight of oven-dry pine litter could absorb 1.5 times its weight of water. Fully 95 per cent of the litter was composed of needles.

Work at the Upper Peninsula Forest Experiment Station near Marquette, Mich., included a comparison of four methods of cutting in northern hardwood forests which removed 35.4, 63, 93.7, and 100 per cent of the marketable lumber. Studies of the influence of drainage on the growth of swamp forests were conducted in an abandoned swamp drainage project near Duluth. The drainage had reduced the water level from close to the surface to a depth of from 2 to 3 ft. Analyses of the stems showed that both tamarack and black spruce had responded markedly to improved drainage, even at distances of 130 to 225 ft. from the ditches. One tamarack tree more than doubled its dimensions in seven years. Records taken in a drained area at Grand Rapids, Minn., showed an increase of 92 per cent in volume 15 years following drainage. Water-level readings taken in two experimental swamps indicated that the nature of the soil greatly influences the efficiency of drainage. The response to changes in the gates in an open undecomposed sphagnum moss swamp in Minnesota was very rapid, while in a well decomposed woody peat swamp in Michigan the ditches were not really effective in lowering the water table.

Thinning studies were conducted in a crowded mixed stand of jack and Norway pines in the Minnesota National Forest to determine the proper spacing in young stands.

Experiments with classes of stock suitable for forest planting in the northern Rocky Mountains, W. G. WAHLENBERG (*Jour. Agr. Research* [*U. S.*], *36* (*1928*), *No. 12*, *pp. 977–1000*, *figs. 11*).—A summation of the results of planting experiments in Idaho and Montana with western yellow and western white pine stocks showed that in general large stock survived better than small stock, especially on southern exposures where drought conditions in summer were often a limiting factor. Transplanting in the nursery was shown to be a worthwhile operation, except in the case of stocks planted on unusually favorable sites. Observations on 1–2 western yellow pines root pruned to 4, 6, 8, and 10 in. before planting showed survivals of 80, 85, 91, and 94 per cent, respectively, at the end of the first season. This and other tests indicated the advisability of using stock with good root development. Noting better survival in stock with a low top to root ratio, an attempt was made to increase this ratio by pruning the top of western yellow pines. The results were unfavorable with April plantings, but light pruning of late planted stocks gave slightly beneficial results.

On a basis of net costs per unit of survival seedling stocks proved most economical on favorable sites, but on the more exposed sites transplants were more economical. Medium-sized stocks of western yellow pine proved superior on good sites. Western white pines graded into four sizes showed good survival in all except the smallest grade. In general the season of planting had but little influence on survival.

Losses through root exposure in the establishment of pine plantations, S. E. Carter (*Aust. Forestry Jour., 11 (1928), No. 2, pp. 54, 55*).—A brief report of a test in southern Australia with well grown *Pinus insignis* seedlings averaging 8 in. tall, which were transplanted after allowing the roots to lie exposed on the ground for periods ranging from 10 minutes to 2.5 hours. With 50 minutes or more exposure, all seedlings subsequently died. In fact any exposure greater than 10 minutes was fatal to a large majority of the seedlings.

Concerning normal stocking of even-aged stands, F. X. Schumacher (*Jour. Forestry, 26 (1928), No. 5, pp. 608–617, figs. 3*).—Asserting that the conception of normality of stocking which serves in laying out and measuring so many sample plats must be common to all field parties if the resulting tables for the same species on equivalent site qualities are to be uniform, the author explains how the strict normality of stocking or maximum yield actually obtainable is measurable from the regression of basal area (or cubic volume) on number of trees, and, when expressed as a deviation from tabular values of basal area or volume, should be published with each yield table constructed by the site index method.

A study of increment growth after thinnings, P. W. Robbins (*Michigan Sta. Quart. Bul., 11 (1928), No. 1, pp. 30–32*).—Records taken in 1925 and again in 1928 in a 1-acre sample plat established in a mixed stand of hardwoods thinned in 1914 showed a rate growth of 4.7 per cent. The total number of trees declined from 751 in 1925 to 678 in 1928, the loss occurring in small sizes due largely to natural suppression. The unusual gains are ascribed to a full but uncrowded stand and show the value of careful management.

Breakage loss in logging, W. W. Wagener (*Jour. Forestry, 26 (1928), No. 5, pp. 639–648*).—Citing the very appreciable losses occurring from breakage under unfavorable logging conditions, the author presents the results of a study carried out on four different settings in lumbering operations in mixed stands of native conifers of the yellow pine and sugar pine type in the Stanislaus National Forest, California. The average diameter at breast height for the yellow pine was about 40 in. and for the sugar pine about 56 in. The total number of breaks for yellow pine was one for every 3,100 bd. ft. and for sugar pine one to 3,600 bd. ft. Most of the breakage occurred in felling. Even in the setting where steep slopes and rough contours prevailed, the loss from yarding amounted to only one-half of one per cent.

Timber depletion, lumber prices, lumber exports, and concentration of timber ownership (*U. S. Dept. Agr., Forest Serv., 1928, 3. ed., pp. 78, figs. 22*).—A summary of this report was previously noted (E. S. R., 43, p. 649).

DISEASES OF PLANTS

Phytopathological investigations in the forests of the Moscow Province in the summer of 1926 [trans. title], E. Karpova-Benua (*Mater. Mikol. i Fitopat. (Mater. Mycol. and Phytopath.), 6 (1927), No. 1, pp. 314–323*).—This is a survey report of the types of forest tree infection over an area of 8,949 hectares (22,104 acres). Among the infecting organisms the author noted *Trametes pini* and *Peridermium pini* on pines and *Fomes annosus* on spruce. On the deciduous trees the most frequent attacking fungus was *F. igniarius*. *F. fomentarius* was noted especially on birch. In every case a determination of the soil type was made.

The fungicidal properties of soda [trans. title], A. R. PATKAN'IAN (PATKANIANE) (*Mater. Mikol. i Fitopat.* (*Mater. Mycol. and Phytopath.*), *6* (*1927*), *No. 1, pp. 193–203*).—The saprophytes used in the experiments included *Leptosphaeria periclymeni tatarica*, *Rhabdospora lonicerae*, *Nectria ribis*, *Cucurbitaria caraganae*, *Tubercularia vulgaris*, *Rhizopus nigricans*, and *Penicillium glaucum*. Of parasites the author used *Rhytisma salicinum*, *Melampsora salicis*, *Microsphaera alni lonicerae*, *Podosphaera oxycanthae*, *Sphaerotheca mors-uvae*, and *Peronospora ficariae*. The spores were introduced under aseptic conditions into Van Tieghem cells, and the soda solution was added, the strengths used being 0.1, 0.01, 0.001, 0.0001, and 0.00001 N. Another series of solutions consisted of soda and nutrients.

In general, all of the fungi were affected in a similar manner. With the increase in concentration of the soda the germination of the spores became inhibited. Without nutrients the fungi failed to grow at 0.1 N concentration. Rhabdospora and Tubercularia ceased to grow at a 0.001 N concentration. With nutrients the species Nectria, Leptosphaeria, Rhabdospora, Penicillium, and Melampsora ceased to grow at a 0.2 N concentration.

The author concludes that soda is an effective fungicide in case of certain of the less resistant spores.

Chemical hydrated lime for the preparation of Bordeaux mixture, E. B. HOLLAND and G. M. GILLIGAN (*Phytopathology, 17* (*1927*), *No. 8, pp. 571, 572*).—Tests are reported of nine samples of chemical hydrated lime, representing deposits from Indiana, Missouri, Pennsylvania, Virginia, and West Virginia, used for the preparation of Bordeaux mixture. All the samples tested are said to have proved satisfactory for this purpose. and they can be recommended as desirable substitutes for quicklime.

The life history of Camptoum curvatum [trans. title], L. S. GUTNER (*Mater. Mikol. i Fitopat.* (*Mater. Micol. and Phytopath.*), *6* (*1927*), *No. 1, pp. 301–313, figs. 3*).—The author conducted a series of culture and inoculation experiments with *C. curvatum* and found that it occurred in various forms on *Scirpus sylvaticus*, *Typha latifolia*, *Sparganium ramosum*, *Potamogeton natans*, *Alisma plantago*, *Phragmites communis*, *Triticum* sp., *Hordeum* sp., *Avena* sp., *Phalaris arundinacea*, *Juncus conglomeratus*, *Iris pseudacorus*, *Naumburgia thyrsiflora*, and *Veronica beccabunga*.

According to the author, the ascospores indicate that the fungus belongs to the genus Pseudoguignardia.

Artificial infection with Hypochnus solani [trans. title], A. RAILLO (*Mater. Mikol. i Fitopat.* (*Mater. Mycol. and Phytopath.*), *6* (*1927*), *No. 1, pp. 166–179, figs. 4*).—In experiments with *H. solani* the author infected buckwheat, pea, cabbage, clover, carrot, oat, cucumber, sunflower, wheat, rye, radish, beet, tobacco, tomato, bean, sorrel, hop, squash, lettuce, and barley plants. Cucurbits and tomato suffered most severely. The basidial stage was found on radish and barley at the same time as on potato. After harvesting the crops sclerotia were found on the roots of all the plants except lettuce, bean, pea, and rye. The yields of the root crops were greatly diminished. The appearance of the basidial stage depends on the moisture content of the soil and of the atmosphere.

Powdery mildew on Dipsacus fullonum in Crimea [trans. title], M. S. KORENEV (*Mater. Mikol. i Fitopat.* (*Mater. Mycol. and Phytopath.*), *6* (*1927*), *No. 1, pp. 48–53*).—Soda, lime sulfur, and flowers of sulfur were used in attempting to control *Sphaerotheca macularis*. Soda was found to be injurious, and sulfur the most effective.

Cereal rusts in the Far East [trans. title], L. RUSAKOV (ROUSSAKOV) (*Mater. Mikol. i Fitopat.* (*Mater. Mycol. and Phytopath.*), *6* (*1927*), *No. 1, pp. 96–122,* *figs.* 2).—From data obtained in 1925, it was found that of the various cereals grown in the Amur region wheat suffers more from rust, the stem rust being the most injurious type. In the maritime province of the region as much as 35 per cent of the wheat crop was lost. Lodging is one of the common results of rust attacks, which are favored by foggy conditions.

Inheritance of resistance to rusty blotch in barley, W. W. Mackie (*Jour. Agr. Research* [*U. S.*], *36* (*1928*), *No. 11, pp. 965–975, figs. 5*).—In a previous publication Mackie and Paxton reported that rusty blotch of barley had been definitely determined to be caused by *Helminthosporium californicum* (E. S. R., 54, p. 745). In the present paper a detailed account is given of a study of the inheritance of resistance to rusty blotch in a cross between a susceptible and an immune variety of barley (E. S. R., 59. p. 146).

In crosses between Chevalier, an immune variety of barley, and Abyssinian, a susceptible one, and their reciprocals, no rusty blotch attack occurred on any of the F_1 plants. In the F_2 generation the segregation occurred in a 3 to 1 ratio, indicating a single factor difference for rusty-blotch resistance. This ratio was confirmed by F_3 families from the F_2 plants. No infertility was observed as a result of species crossing, and no decided evidence of linkage was found.

Dust treatments for the control of oat smut in Idaho, J. M. Raeder and C. W. Hungerford (*Phytopathology, 17* (*1927*), *No. 8, pp. 569, 570*).—In continuation of experiments previously reported in part by Lambert, Rodenhiser, and Flor (E. S. R., 58, p. 648), tests were made of 12 treatments of hulled and hull-less oats for the control of smut. Almost perfect control was secured with copper carbonate dust and with corrosive sublimate combined with various fillers. A dust composed of 1 part Palouse soil to 2 parts corrosive sublimate applied at the rate of 3 oz. per bushel of seed grain gave perfect freedom from smut in both hulled and hull-less oats. Although other dusts controlled smut to a certain degree, none proved as efficient as copper carbonate or corrosive sublimate.

The problem of rust infection source in the Amur region [trans. title], **A. Shitikova-Rusakova** (*Mater. Mikol. i Fitopat.* (*Mater. Mycol. and Phytopath.*), *6* (*1927*), *No. 1, pp. 13–47, figs. 2*).—In the Amur region, on account of the open, snow-free winters, no winter wheat is grown. The rusts have no host on which to overwinter, and the absence of barberry precludes this as an intermediary source of infection. The rusts, however, are prevalent. It was found that the wheat belt of northern Manchuria serves as a source of infection, the spores being carried by the wind. The degree of infection depends on conditions such as rainfall, drought, and other local factors.

The spores were caught with aeroscopes at different heights from the surface of the plants. It was found that the greatest numbers were present at heights of from 2 to 4 meters and in the daytime.

The author gives a complete and detailed description, with illustrations, of the type of aeroscope used.

Bacterial wilt and winter injury of alfalfa, F. R. Jones and J. L. Weimer (*U. S. Dept. Agr. Circ. 39* (*1928*), *pp. 8, figs. 2*).—Bacterial wilt and winter injury are believed to account for a large part of the early dying out of alfalfa fields in many alfalfa-growing regions of the United States. The wilt is caused by bacteria, which enter through wounds in the crown and root. Winter injury is said to result in the killing of buds and of parts of the root and crown of the plant during winter, and through the wounds produced bacteria causing wilt may readily enter.

The authors believe that wilt can be controlled by the prevention of the conveyance of bacteria by water from old diseased plants to young fields, especially in the spring when plants have wounds due to winter killing. Care should also be taken to avoid transferring the bacteria to new fields in fragments of diseased stems, with unclean seed, or with manure.

Hardy varieties of alfalfa are said to be often injured sufficiently during the winter to make infection with bacterial wilt possible. Therefore the use of such varieties does not always prevent, although it may reduce, loss from this disease.

A study of the fungous flora of the nodal tissues of the corn plant, C. L. PORTER (*Phytopathology, 17* (*1927*), *No. 8, pp. 563–568, fig. 1*).—In connection with a survey made by the Indiana Experiment Station of some of the corn-producing areas of the United States, the author made a study of the fungi and bacteria found within the cornstalks. Cultures were made of a large number of stalks received from 24 States, the corn having been grown in fields representing many different soil types, fertility needs, physical conditions, etc. The investigation was made to determine the flora resident in the nodal tissue of the corn plant, to ascertain whether the breakdown of the nodal tissue is more frequently associated with the chemical and physical condition than with the presence of certain specific organisms, and to determine if the chemical reserves of the stalk tissues have any appreciable effect on the kind of organisms present.

A great variety of organisms, mostly saprophytic, was found in the nodes of cornstalks, there being a higher percentage of sterile platings from the upper nodal tissues than from the lower ones. Sterile platings were more frequently made from nodes carrying a low iron content. No close correlation was found between the kind of fungi in the nodal tissues and the soil type or degree of fertility of the soil, with the exception that in plants containing a potassium reserve there was a greater tendency for the tissues to be healthy and sterile, and organisms were almost always found in tissues containing accumulations of iron.

According to the author, no one organism, or several organisms, can be ascribed as primary agents in causing the decomposition of nodal tissues.

Seed treatment tests for seed-borne disease of cotton and corn, C. T. AMES and O. B. CASANOVA (*Mississippi Sta. Bul. 253* (*1927*), *p. 18*).—One season's work with some organic mercury compounds for the control of corn root, stalk, and ear rots, and the seed-borne diseases of cotton is said to indicate the possibilities of such disinfectants for the control of these diseases under north Mississippi conditions.

The occurrence of the white rust of crucifers and its associated downy mildew in the Philippines, G. O. OCFEMIA (*Philippine Agr., 14* (*1925*), *No. 5, pp. 289–296, pls. 2*).—The white rust of crucifers caused by *Cystopus candidus* (*Albugo candida*) and the downy mildew caused by *Peronospora parasitica,* both hitherto unreported from the Philippines, were collected early in 1925 on mustard and pechay grown in the gardens of the College of Agriculture at Los Baños and vicinity, Laguna Province. To date only weakened plants have been seriously attacked. The conidia and conidiophores of the *C. candidus* appear slightly smaller than those reported elsewhere. The conidia of *P. parasitica* are also slightly smaller, although the conidiophores are somewhat larger. No sexual or oosporic stages of either fungus have yet been found. It is thought that general sanitary measures and the production of vigorous plants are sufficient to control both diseases.

Downy mildew (Sclerospora graminicola) on Everglade millet in Florida, W. H. WESTON, JR., and G. F. WEBER (*Jour. Agr. Research* [*U. S.*], *36* (*1928*), *No. 11, pp. 935–963, pls. 2, figs. 4*).—The occurrence of S. *graminicola* on the Everglade millet in Florida was reported in 1926 by the authors (E. S. R., 58, p. 549). Additional studies were made to determine the activity of the parasite on the host plant and the possibility of the fungus becoming a menace to Florida agriculture.

The fungus has been found on Everglade millet in 14 counties in Florida, but not elsewhere in the Southern States, and on no other species of plant. The attack of the fungus is said to result usually in a conspicuous systemic infection, and the grass does not recover, the new shoots being invaded successfully as they sprout. A local type of infection, manifesting itself in an inconspicuous scattered spotting of the leaves, is also reported.

The authors state that the disease, in nearly five years' observation, has not been found to be of any economic importance in Florida, nor has it given any indication of probability that it will become so in the future unless it should change to valuable plantings of susceptible crops.

Further studies of potato hollow heart, H. C. Moore and E. J. Wheeler (*Michigan Sta. Quart. Bul., 11 (1928), No. 1, pp. 20–24*).—Studies were made to determine the effects of nitrogen, phosphorus, and potash used separately and in various combinations on hollow heart and yield; the effect of water on hollow heart and yield; and also the extent to which hollow heart may be controlled by close planting.

The authors claim that hollow heart of the Russet Rural potato is likely to be serious in seasons when the rainfall during August is normal or above. Deficient rainfall in this period was found to check the development of hollow heart. Potash applied alone delayed the maturity of the vines and increased the percentage of hollow potatoes. A complete fertilizer gave increased yields without increasing the percentage of hollow heart potatoes. Closer spacing of hills proved one of the most effective means of improving the market quality of potatoes by reducing hollow heart and increasing the yield of medium sized, well shaped potatoes. The maximum spacing distance recommended for the Russet Rural variety is 36 by 18 in.

Large seed pieces are said to be a factor in lessening the percentage of hollow potatoes and in increasing the yields. Potatoes from giant hill plants were found to be seriously affected with hollow heart.

It is recommended that growers of table stock potatoes plant certified seed and rogue their fields to remove giant hills.

Net necrosis of the potato, A. H. Gilbert (*Phytopathology, 17 (1927), No. 8, pp. 555–561, figs. 4*).—The author believes that net-necrosis of potato tubers as described by Atanasoff (E. S. R., 59, p. 148) is quite distinct from the disease as known in this country. From a study of net-necrosis of the phloem necrosis type as it occurs in the Green Mountain variety, the author points out that the term "net-necrosis" has an accepted significance in the United States as applying to the browning and dying of the phloem tissues of the tuber, both outside and inside of the cambium. It is found to be associated with leaf roll to the extent that necrotic tubers consistently produce leaf roll plants. Net-necrosis does not persist in leaf roll stock, but is believed to be a result of initial leaf roll infection.

Sclerotinia wilt of sunflowers, P. A. Young and H. E. Morris (*Montana Sta. Bul. 208 (1927), pp. 32, pls. 3, figs. 8*).—It is said that sunflower wilt caused by *S. libertiana* was discovered in Montana in 1920, and that it destroyed from 0.1 to 80 per cent of cultivated sunflowers where rotation was not practiced, and from 0.1 to 10 per cent where rotation was followed.

The fungus is said to be a wound parasite of wide host range, and it spreads rapidly in rows of sunflowers unless the stalks are at least 30 cm. (12 in.) apart.

Methods recommended for the control of sunflower wilt are a 4-year rotation with cereal and hay crops, the use of clean seed, and agricultural sanitation.

The nematode disease of sweet potatoes, R. F. Poole and R. Schmidt (*Phytopathology, 17 (1927), No. 8, pp. 549–554, pls. 2, fig. 1*).—The authors claim that nematode or eelworm disease is the cause of heavy losses of sweet potatoes in the eastern part of North Carolina. Some of the popular commercial and other strains of sweet potato varieties were tested on infected soils and the varieties Porto Rico and Jersey were found very resistant to nematodes, while all of the other important varieties were quite susceptible. Root infection of the resistant varieties was very slight, only a few definite blister to scablike scars occurring on the potatoes. On the susceptible varieties knots and scabs were produced on stems, roots, and potatoes.

Tobacco frenching—a nitrogen deficiency disease, W. D. Valleau and E. M. Johnson (*Kentucky Sta. Bul. 281 (1927), pp. 175–253, figs. 12*).—A detailed account is given of a study of frenching, of which a preliminary report of the principal conclusions has been noted (E. S. R., 57, p. 515).

Frenching of tobacco is said to be characterized by chlorosis of the leaf tissue between the veins or, in severe cases, the growing point of the plant may be chlorotic. The disease was repeatedly produced by causing a condition of nitrogen starvation, and the plants were restored to normal appearance by the addition of nitrogen in available form to the soil. Heating virgin soil to 65° C. had the same effect on frenching as did the addition of nitrogen. Adding calcium oxide to virgin soils stimulated the growth of tobacco plants and prevented frenching. However, a second crop of tobacco in the same soil was badly frenched.

The authors present evidence which is held to suggest that drought spot, cork spot, and bitter pit of apples, and blossom-end rot of tomatoes are diseases of the same general nature as frenching and are due to nitrogen starvation of the affected tissues. The theory is also advanced that brown bark spot of apples and other trees is a disease due to nitrogen starvation.

Commercial tobaccos and cured leaf as a source of mosaic disease in tobacco, W. D. Valleau and E. M. Johnson (*Phytopathology, 17 (1927), No. 8, pp. 513–522; abs. in Phytopathology, 17 (1927), No. 1, p. 49*).—A detailed account is given of investigations previously briefly reported (E. S. R., 58, p. 51). The results are said to indicate that in regions where cured tobacco is commonly chewed by tobacco growers it may be an important source of mosaic infection, especially at weeding and at pulling time. Commercial chewing tobaccos were not as important a source of infection as the natural leaf. Cigarettes and granulated smoking tobaccos were also found to play a minor part in the mosaic problem in the commercial planting of tobacco, but they are believed to be of importance in connection with plantings of susceptible plants, such as tomatoes grown under glass or under intensive culture in the field.

It is believed to be not at all improbable that many cases of sporadic mosaic infection in tomatoes and tobacco may have originated from fingers which had become contaminated while smoking cigarettes.

The effect of a strain of tobacco mosaic on the yield and quality of Burley tobacco, W. D. Valleau and E. M. Johnson (*Phytopathology, 17 (1927), No. 8, pp. 523–527*).—Two types of mosaic are said to occur commonly in the tobacco fields of Kentucky. One type produces severe stunting accompanied by distortion and a distinct mottling, together with a burning of the leaves. The other type is said to cause only a slight retardation of growth, without any apparent quantitative or qualitative degree of injury.

A study was made of the effect of the mild type of mosaic on the yield and quality of Burley tobacco in 1926. No appreciable reduction in yield was found when the plants were inoculated at topping time, but infection at setting time resulted in a one-third reduction in yield. The leaves of plants inoculated at setting time were shorter and of lower quality than the leaves of either the check or those inoculated at topping time. When inoculated at topping time, although the yield was not reduced, there was a reduction in the value of the crop.

Observations and experiments on the control of true tobacco mosaic, W. D. VALLEAU and E. M. JOHNSON (*Kentucky Sta. Bul. 280 (1927), pp. 143–174, figs. 6*).—A popular description is given of tobacco mosaic, the elimination of which is considered an important factor in tobacco production.

The mosaic disease is said to overwinter in horse nettles and ground cherries, but these are considered to be relatively unimportant as sources of infection at setting time. It is said to overwinter also in cured tobacco, and that if it is chewed by men pulling plants and the mouth is wiped so that the juice gets on the hands the disease is readily transmitted to plants as they are pulled from the seed bed. This is considered to be the chief early source of mosaic infection in Kentucky. Mosaic plants are said to be rarely found in plant beds at the time of first pulling where no natural leaf tobacco has been chewed by the workers while weeding the beds. The disease has been completely controlled or reduced to a point where it is of little importance by the simple expedient of substituting sterile tobacco for the natural leaf tobacco usually chewed by the pullers or by prohibiting the use of tobacco completely by those working about the plant beds.

The authors found that tomato mosaic may be caused by the tobacco mosaic virus and the disease transmitted as readily to tomatoes as to tobacco if diseased tobacco is being chewed by persons handling tomato plants.

The recommendations for the control of tobacco mosaic include thorough burning or steaming of the seed bed, keeping tobacco trash from the bed, elimination of natural leaf chewing tobacco while handling the plants, the destruction of any mosaic plants which develop in the field, or, if this is not done, making it a point never to handle a mosaic plant if healthy ones are to be handled subsequently.

Powdery mildew on tobacco on the southern shore of Crimea in 1926 [trans. title], L. A. ALEKSANDROV (*Mater. Mikol. i Fitopat. (Mater. Mycol. and Phytopath.), 6 (1927), No. 1, pp. 58–66*).—The increased acreage of tobacco was associated with a severe outbreak of mildew. Control measures recommended include avoidance of planting where tobacco has previously been grown, also in orchards or in shade; planting farther apart in the row; avoidance of excessive irrigation; burning of the stems and roots after harvesting the crop; and dusting sulfur on the lower leaves or on the ground.

The Phytophthora disease of eggplant in the Philippine Islands, G. O. OCFEMIA (*Philippine Agr., 14 (1925), No. 6, pp. 317–328, pls. 2 figs. 4*).—The disease of eggplant caused by *P. melongenae* is said to occur in Japan and in the Philippines. Although usually of minor economic importance, serious losses may develop during wet seasons in fields where the plants are set closer than 1 meter apart. It is stated that this Phytophthora differs somewhat from that in Japan, though this fungus is referred to the species *P. melongenae*.

The fungus may live saprophytically on organic matter and débris in the soil from season to season. It is spread by the action of rain water and by cultural operations.

The occurrence and severity of the disease are influenced by environmental conditions which are not yet fully understood. Infection may be reduced by wider planting so as to admit sunshine and provide freer circulation of air. Recommendations include proper cultural practice, general sanitary measures, and spraying with Bordeaux mixture at intervals of 2 weeks in large commercial plantings.

Anthracnose of pepper, D. B. MALABANAN (*Philippine Agr., 14 (1926), No. 8, pp. 491–501, figs. 2*).—Anthracnose of pepper (*Capsicum annuum*) is said to be common at the college and in gardens around the college farm at Los Baños, and to occur also in Burma, India, and several American States. It is only of minor economic importance as a rule, though late plantings or dry season plantings are usually attacked at the beginning of the rainy season. The development of the disease is described. It is believed that the Colletotrichum causing pepper anthracnose in the Philippines is identical with *C. nigrum*. The fungus is a weak parasite attacking peppers only after the occurrence of injury or weakening conditions, but when entrance has been gained the fungus spreads through the tissues of the host rapidly, particularly during warm, moist weather. Sweet peppers are subject to attack, though hot varieties are resistant. The fungus attacks eggplant and tomato in case of weakness or injury, and may cause storage rots of certain vegetables in case of dampness or careless handling. The fungus is spread in gardens by rainfall, certain insects, and probably other means. The disease is controllable by proper methods of planting, sanitation, and seed selection.

Diseases of apple tree bark under conditions in the lower Volga region [trans. title], V. K. LEVOSHIN (LEVOSCHINE) (*Mater. Mikol. i Fitopat. (Mater. Mycol. and Phytopath.), 6 (1927), No. 1, pp. 214–226, figs. 4*).—From investigations on apple bark injury produced by *Sphaeropsis malorum*, the author concludes that the generally accepted view of fruit growers, that bark injury is a result of thermal changes during the latter part of the winter, is only partially correct. The injury thus produced and the injury produced by insects may serve as avenues of infection by the fungus. The mechanical causes and insect attacks alone do not usually produce injury severe enough to threaten seriously the life of the trees, and in most cases the apple trees survive. The higher limbs suffer most from the conditions described.

Varietal susceptibility of Ada Red and certain other apple varieties to cedar rust, with special reference to twig infections, V. H. YOUNG (*Phytopathology, 17 (1927), No. 8, pp. 541–543, figs. 2*).—The author's attention was called to a serious attack of cedar rust on the wood of 1-year-old apple trees of the variety Ada Red. In one nursery more than 9 per cent of the trees were badly affected on the main stem, and in another nursery of the same variety about 7 per cent of the trees were affected. Standard varieties in the same nurseries did not seem to be attacked by the fungus.

The black walnut (Juglans nigra L.) as a cause of the death of apple trees, F. J. SCHNEIDERHAN (*Phytopathology, 17 (1927), No. 8, pp. 529–540, figs. 9*).—Attention is called to the incompatibility between black walnut and apple trees in an orchard near Winchester, Va. Further investigations showed that a total of 16 walnut trees had apparently caused the death of 48 apple trees of different varieties. In addition, 14 apple trees were either dwarfed or injured on one side by these same walnut trees. The maximum distance at which an apple tree was probably killed by walnut toxicity was found to be about 80 ft.

Soggy breakdown of apples and its control by storage temperature, H. H. PLAGGE and T. J. MANEY (*Iowa Sta. Research Bul. 115 (1928), pp. 57–118, figs. 22*).—In a previous publication Plagge reported two types of injury that appeared in storage apples (E. S. R., 57, p. 352). Subsequently the authors continued investigations on the effect of low temperatures on a number of varieties of apples, and in the present publication they give the results of studies on the condition designated as soggy breakdown.

Soggy breakdown is claimed to be a nonparasitic disease which develops at low temperatures and is distinguished from internal breakdown and from physiological decay or the breakdown which accompanies senescence. For the latter disease the authors suggest the name mealy breakdown.

The disease is characterized by the appearance in the cortical region of small, light brown areas in tissue adjoining vascular strands. It does not, however, begin at the primary vascular bundles, although in later stages tissue adjacent to this may be involved. The discolored areas are said to vary considerably in size and number, according to the severity of the disease. If the conditions causing soggy breakdown are prolonged, a complete ring of soft, brown, dead tissue is formed, which is readily seen in transverse sections. The affected tissue is sharply defined from the remaining sound white portion of the core region. The proximity of brown tissue to the skin determines the extent of external discoloration. In the more typical specimens no brown discoloration of the skin was observed, and the apples appeared to be sound until cut open. A characteristic sponginess of the fruit, due to the underlying soft tissue, is said to make it easy to detect the disease.

Grimes and Wealthy apples were found to be very susceptible to soggy breakdown, while Jonathan, Arkansas, Willow, and Northwestern Greening appeared immune. The initial appearance of soggy breakdown on Grimes in cold storage occurred during the early part of December, and differences of 2 and 4° F. in cold storage temperatures markedly affected the development of the disease. No serious amount of soggy breakdown occurred on fruit stored at 36° or on fruit held in common storage.

The authors recommend the storage of Grimes apples at a temperature of 36° or slightly higher. An increase in the tendency of Grimes to apple scald, due to a higher storage temperature, was successfully averted by the use of oiled paper wraps.

Cherry trees defoliated by leaf spot, F. C. Bradford (*Michigan Sta. Quart. Bul., 11 (1928), No. 1, p. 7*).—Sour cherry trees in Michigan are said to have been severely attacked by leaf spot in 1928. Trees were defoliated by midsummer, and such trees are considered to be especially subject to winter injury. Based on previous observations, it is said that some trees that are not winterkilled show a type of injury called blackheart. These gradually become weaker from season to season and finally die. Blackheart, however, may be overcome, and the author recommends light pruning and heavy fertilization that will favor foliage development.

Pear rust (Gymnosporangium sabinae) and methods of control under Crimean conditions [trans. title], **K. N. Dekenbakh** (**Dekenbach**) (*Mater. Mikol. i Fitopat.* (*Mater. Mycol. and Phytopath.*), *6 (1927), No. 1, pp. 68–91*).—The author gives a comprehensive review of the literature on pear rust (*G. sabinae*), discussing the various methods of control, such as spraying and destroying the host plants, in particular juniper, and he presents his own experimental data and observations. Experiments in which pear trees were isolated either by inclosing them under a glass cover partially shaded or by covering them with gauze resulted in 100 per cent control. This is held to prove that pear rust does not overwinter on the pear tree. Partial control of rust is secured by building screens on the side from which the spores are usually blown.

Michigan raspberry diseases, C. W. Bennett (*Michigan Sta. Spec. Bul. 178 (1928), pp. 52, figs. 33*).—Descriptions are given of a number of diseases to which raspberries are subject in Michigan. For their control the author recommends the planting of vigorous, disease-free plants; removal of the old canes from black raspberry tips before planting; roguing the plantations the first year for curl, mosaic, streak, and orange rust; roguing older plantations if the percentage of disease is not too high; planting black raspberries at a distance of at least 50 yds. from red raspberries; and spraying black raspberries for anthracnose control.

Notes are also given on the susceptibility of resistance to diseases of a number of varieties of red and black raspberries.

The cause of the anthracnose of avocado, mango, and upo in the Philippine Islands, G. O. Ocfemia and J. A. Agati (*Philippine Agr., 14 (1925), No. 4, pp. 199–216, pls. 3*).—Anthracnose is now a serious disease of avocado, mango, and upo in the Philippines. This disease is said to have been reported as on avocado in Trinidad and Tobago, the Hawaiian Islands, Florida, California, Porto Rico, West Indies, and Guatemala; and on mango in Florida, Porto Rico, Cuba, Trinidad and Tobago, the Hawaiian Islands, and Guatemala. Anthracnose of the upo (white squash) or closely related species and of other cucurbits occurs in the United States east of the Rocky Mountains, in Europe, and in the Philippine Islands. Degrees of severity and other features, characters, and ranges are indicated for the causal fungus, *Glomerella* sp., closely related to or perhaps identical with *G. cingulata*. Cool, moist, and shady conditions favor the development of the disease, as do also young tender succulent growths. Conidia on infected portions are sources of inoculum for both primary and secondary infections. Asci on dead and rotting avocado, mango, and upo leaves, twigs, and fruits may start primary infection. The perithecial stage is the resistant form capable of tiding the fungus over adverse environmental conditions.

It is believed that under Philippine conditions insects, rain, and wind are responsible for the wide dissemination of the spores of the fungus.

The disease may be controlled by careful sanitary measures, use of resistant varieties, and control of insects, to which may be added, perhaps, protection of delicate tissues with fungicides.

Citrus chlorosis as affected by irrigation and fertilizer treatments, P. S. Burgess and G. G. Pohlman (*Arizona Sta. Bul. 124 (1928), pp. 183–232, pls. 3, figs. 7*).—The authors report the deterioration of citrus groves in the Salt River Valley and on the Yuma Mesa of Arizona. As the condition noted was not caused by organic diseases but was apparently due to a general physiological derangement of the trees, an effort was made to prevent further damage and to improve the condition of the trees through soil treatments. Detailed physical, chemical, and bacteriological studies were made of soils from groves, soil moisture and fertilizer experiments were carried on in the field, and laboratory investigations were made, with particular reference to the effect of calcium carbonate on producing chlorosis and of means for preventing its injurious action.

The laboratory work showed that the soils were free from toxic concentrations of the alkali salts, but fairly high in calcium carbonate and alkaline in reaction. The total nitrogen was low in all cases, but its availability was high. Total and available potash were also high. The total phosphoric acid content was fairly high, but its availability was slight. The bacteriological studies indicated a fair degree of microbiological activity, nitrogen fixation being exceedingly high. From the laboratory work, it appeared that organic matter, nitrogen, and soluble phosphates should be of value on the soils in question.

Fertilizers and soil amendment studies conducted in the groves showed that there was a slight improvement where both manure and double superphosphate were applied deeply. Otherwise the results of the fertilizer treatments appeared to be largely negative. Spraying the chlorotic foliage with solutions of ferrous sulfate and manganese sulfate was also without permanent effect.

Field moisture-control work, on the other hand, was extremely successful, and where the irrigation program was changed to conform to the information secured from soil moisture studies, remarkable recovery usually took place in the trees. The irrigation practice recommended consists of a heavy irrigation (5 or 6 in.) in basins, after which the soil is permitted to approach closely the wilting point before another irrigation. This drying out permits soil aeration, which is of great importance in citrus culture.

Pot-culture work with grapefruit seedlings in the greenhouse showed that excessive amounts of calcium carbonate in the substratum caused chlorosis, but that this condition could be alleviated to a large extent by the application of organic materials. The best results were obtained by adding peat and muck to the soil. These were followed in effectiveness by alfalfa and manure.

Fungous diseases attack trees in wet seasons, F. C. Strong (*Michigan Sta. Quart. Bul., 11 (1928), No. 1, pp. 13–17, figs. 2*).—Brief descriptions are given of anthracnose of sycamore and white oak, tar spot of maple, elm leaf spot, powdery mildews and sooty molds, leaf blotch of horse-chestnut, and leaf scorch. In general, trees are not severely injured but are rendered unsightly by these diseases. In most cases they recover without apparent loss of vigor.

Further work on treatment of "wet-root rot," A. Sharples (*Malayan Agr. Jour., 15 (1927), No. 2, pp. 35–40*).—The present article, a continuation of that previously noted (E. S. R., 58, p. 156) and a reproduction in part of what was written in that article, states that full confirmation has been obtained of the prediction that this disease would appear in cycles. The first cycle of disease can, it is stated, be expected sometime after the tenth year. If no attention is paid to trees having slightly infected roots the second cycle can be expected to occur about the fifteenth year, and the reduction in the number of profitable old trees is bound to continue, so that many properties in Malaya will suffer heavy losses. The methods of protection detailed in this article have shown good results with Hevea trees up to 30 years of age.

The rot of Picea caused by Polystictus (Polyporus) triqueter [trans. title], F. A. Solov'ev (Soloviev) (*Mater. Mikol. i Fitopat. (Mater. Mycol. and Phytopath.), 6 (1927), No. 1, pp. 295–300, figs. 3*).—This rot develops in the central portion of the tree trunk and works its way downward into the roots. In the early part of the attack the heartwood becomes spotted. As the rot advances the spots become hollow places, afterwards gradually filling up with mycelium. In the later stages of the rot cracks mark the annual rings. The rot goes up to a height of 2.5 to 3 meters but always penetrates into the roots, where it develops very rapidly throughout the root system. The wood in the different stages of attack was tested as to specific gravity and resistance to compression. Early in the development the resistance to compression decreases greatly. The specific gravity also lowers rapidly.

Dothichiza populea and its mode of infection, G. G. Hedgcock (*Phytopathology, 17 (1927), No 8, pp. 545–547*).—The author states that since the first report of this disease in North America (E. S. R., 37, p. 354) the known range of the fungus has been extended in northern and northeastern United States and southeastern Canada, probably through the shipment of diseased nursery stock.

Experiments carried out under natural conditions are said to indicate that the fungus may infect poplar trees by progressive infection from the leaves through the petioles to the twigs and limbs, and also by direct entrance through wounds. Spraying with Bordeaux mixture is suggested as a possible means of control.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Field book of North American mammals, H. E. ANTHONY (*New York and London: G. P. Putnam's Sons, 1928, pp. XXV+625, pls. 49, figs. 160*).—This handy field book gives descriptions of the mammals known north of the Rio Grande, together with brief accounts of their habits, geographical ranges, etc. Illustrations are given of many of the animals, some of which are in colors. A classified bibliography of 12 pages and a colored zone map are included.

The temperature of normal rabbits, P. LAZARUS-BARLOW (*Jour. Path. and Bact., 31 (1928), No. 3, pp. 517–524, figs. 4*).—The author finds that except for a sudden increase in temperature after a cool period, or for a close thundery atmosphere, the temperature of a normal rabbit varies little with the external temperature. The temperature of the normal rabbit, however, varies within wide limits and is subject to sudden rises for no apparent reason. A rise in temperature is caused by food. It is concluded that sudden rises above 104° F. can not be considered pathological unless sustained.

Bacillus enteritidis infection in wild rats, J. C. KERRIN (*Jour. Path. and Bact., 31 (1928), No. 3, pp. 588, 589*).—Following a brief review of the literature on the subject, the author reports upon examinations made of 100 wild rats trapped in various districts of the city of Aberdeen, Scotland. These resulted in the isolation of *B. enteritidis* from the liver and spleen of 10 rats and from the liver only of 1 rat.

The birds of the Malay Peninsula, I, II, H. C. ROBINSON (*London: H. F. & G. Witherby, 1927, vol. 1, pp. L+329, pls. [26]; 1928, vol. 2, pp. XXII+310, pls. [26]*).—This is an account of the birds inhabiting the region from the Isthmus of Kra to Singapore with the adjacent islands. Volume 1 is devoted to the commoner birds and Volume 2 to the birds of the hill stations.

Entomological research: A general scheme, R. J. TILLYARD (*Jour. Council Sci. and Indus. Research [Aust.], 1 (1928), No. 4, pp. 193–201*).—This is a report of a scheme for entomological research submitted by the author to the Council for Scientific and Industrial Research, Australia.

The social insects, their origin and evolution, W. M. WHEELER (*New York: Harcourt, Brace & Co.; London: Kegan Paul, Trench, Trubner & Co., 1928, pp. XVIII+378, pls. 48, fig. 1*).—This work, consisting of lectures delivered during the spring of 1925 at the University of Paris while the author occupied a Harvard exchange professorship, deals with the scope and meaning of the social among the insects; the origin of the Teregrantia and Aculeata; the evolution of wasps, bees, ants, and termites; polymorphism; the social medium and trophallaxis; and the evolution of the guests and parasites of the social insects and of social parasites. An extended conclusion, a bibliography of 37 pages, and an index are included.

Insects of Indiana for 1927, J. J. DAVIS (*Ind. Acad. Sci. Proc., 43 (1927), pp. 445–460, figs. 6*).—A brief summary of the more important insects of cereal and forage crops, vegetables, fruits, shade trees and shrubs, flower garden and ornamental greenhouse plants, and stored products; and household and miscellaneous pests.

[Economic insects in Ohio] (*Ohio State Hort. Soc. Proc., 60 (1927), pp. 22–35, 104–117*).—The papers on economic entomology presented at the annual meeting of the Ohio State Horticultural Society, held at Columbus, February 1–3, 1927, include the following: The Present Status of the Oriental Peach Moth as an Orchard Pest in the United States, by L. A. Stearns (pp. 22–35); Insect Problems of 1926, by J. S. Houser (pp. 104–109); and Codling Moth, by C. R. Cutright (pp. 110–117).

[Economic insects in India], D. Clouston (*India [Dept. Agr.] Rev. Agr. Opr., 1926–27, pp. 61–64*).—A brief account is given of insect pests, followed by an account of useful insects, including bees, lac, and silkworms.

Investigations on entomological problems [in Australia], A. C. D. Rivett and G. Lightfoot (*Aust. Council Sci. and Indus. Research Ann. Rpt., 1 (1926–27), pp. 25–29*).—These notes relate to the underground grass grub in Tasmania, the buffalo gnat pest, insect pests of dried fruit, the lucern flea (*Smynthurus viridis*) in South Australia, the biological control of ragwort and St. John's wort, and the sheep blowfly pest.

Insect pests of sugar cane, including utilization of parasites (*Internatl. Soc. Sugar Cane Technol. Conf. [Havana] Proc., 2 (1927), pp. 57–79*).—Papers on entomology presented at the second conference of the International Society of Sugar Cane Technologists held at Havana, Cuba, in March, 1927, following a general discussion, include those listed below:

Cutting Out Dead Hearts in Moth Stalkborer Control, by H. K. Plank (pp. 62, 63); Dusting Crops by Airplane for Control of Insects, by C. E. Woolman (pp. 63–66); Parasites of the Moth Stalkborer, by T. E. Holloway (pp. 67, 68); Cuban Parasites of the Moth Stalkborer, by H. K. Plank (pp. 68, 69); The Losses from the Sugar Cane Moth Borer in Cuba, by J. T. Crawley (pp. 69–71); Some Grasses That Harbor the Sugar Cane Moth Stalkborer in Cuba, by H. K. Plank (pp. 71, 72); Work with Parasites of Sugar Cane Insects in Hawaii, by H. P. Agee (pp. 72–74); Memorandum on Exploration Trips by Entomologists of the Hawaiian Sugar Planters' Experiment Station for the Purpose of Discovering and Introducing Beneficial Insects, compiled by O. H. Swezey (pp. 74, 75); Plan for a Cooperative International Organization for Parasite Introductions, by H. E. Box (pp. 76–78); and Parasites Introduced into Formosa for Insect Pests of Sugar Cane, by M. Ishida (pp. 78, 79).

Records of blueberry insects in Indiana, K. D. Doak (*Ind. Acad. Sci. Proc., 43 (1927), pp. 441–444, fig. 1*).—In this compilation particular reference is made to the cherry leaf beetle; a fruit worm, probably the apple or blueberry maggot; the stem gall insect (*Hemadas nubilipennis* Ashm.); and the leaf tyer (*Telphusa latifasciella* Cham.)

Some recent advances in the control of insect pests, F. V. Theobald (*Jour. Roy. Hort. Soc., 53 (1928), No. 2, pp. 201–219*).—This is a review of the subject, presented as two lectures.

Field experiments with dormant winter washes, A. M. Massee (*East Malling [Kent] Research Sta. Ann. Rpt., 13 (1925), pt. 2, pp. 101–113, fig. 1*).—These data relate to work noted from another source (E. S. R., 56, p. 359).

Studies on the toxicity of lime-sulphur mixture, C. Harukawa (*Nôgaku Kwaihô (Jour. Sci. Agr. Soc. [Japan], No. 293 (1927); Eng. trans. in Ber. Ōhara Inst. Landw. Forsch., 3 (1927), No. 4, pp. 379–404, figs. 8*).—It is pointed out that in two earlier papers (E. S. R., 48, p. 155) on studies of two kinds of lime-sulfur, of which the first was slightly more effective in killing the scale than the second, both showed practically no difference in regard to the reducing power.

In the present paper the results of experiments conducted with the goldfish and nymphs of a dragon fly, *Anax parthenope julus* Brauer, are reported upon. The experiments showed the first of the two kinds of lime sulfur to be the more toxic. The work with these aquatic animals seemed to show that the suffocation by reduction and the corrosive action are two of the important toxic actions of lime sulfur, although this does not necessarily imply that there is no other action producing a toxic effect. Both the suffocation by reduction and the corrosive action of lime sulfur seem to have a similar effect on the scale insect and the aquatic animal. The difference between these two actions on the scale insect and the aquatic animal is in the degree of effectiveness. The formula proposed by Powers to determine the comparative toxicity is not appropriate to the lime-sulfur mixture. It is necessary, in the case of this spray fluid, to determine the comparative toxicity by comparing the survival periods of the test animals at various concentrations for the two kinds of lime sulfur.

Further tests of poison baits in South Wales, H. W. THOMPSON (*Welsh Jour. Agr., 4 (1928), pp. 342–347*).—Tests with poisoned bran on cereals, cabbage, and garden crops conducted over a period of three years in South Wales are considered to demonstrate the efficiency of the poison bait method of control. Copper sulfate does not appear likely to prove an effective bait poison. Derris powder gave moderately good results, and sodium fluosilicate is considered promising and worth further trial.

The control of termites in buildings, T. E. SNYDER (*Agr. Engin., 9 (1928), No. 8, pp. 240–242, figs. 4*).—In a contribution from the U. S. D. A. Bureau of Entomology practical information on the control of termites in frame wooden structures is presented.

Transmission of potato spindle-tuber by grasshoppers (Locustidae), R. W. Goss (*Phytopathology, 18 (1928), No. 5, pp. 445–448*).—In this contribution from the Nebraska Experiment Station the author reports upon the successful transfer of the spindle tuber virus to healthy plants by grosshoppers of the species *Melanoplus femur-rubrum, M. bivittatus, M. plumbeus,* and *M. angustipennis;* also by *M. packardii* and *M. differentialis* in mixed collections of the above mentioned species.

Parthenogenesis in Thysanoptera: The maturation of parthenogenetic eggs of Heliothrips haemorrhoidalis [trans. title], R. POMEYROL (*Bul. Biol. France et Belg., 62 (1928), No. 1, pp. 1–20, pl. 1*).—The first part of this account, following a brief introduction, is devoted to a review of the literature on the subject (pp. 3–12). This is followed by a report of personal observations of the greenhouse thrips (pp. 12–17). A bibliography of 15 titles is included.

Records of Australian Thysanoptera (thrips), III, A. A. GIRAULT (*Queensland Agr. Jour., 29 (1928), No. 6, pp. 391–394*).—This is the third part of the account previously noted (E. S. R., 59, p. 250).

The American swallow bug, Oeciacus vicarius Horvath (Hemiptera, Cimicidae), L. E. MYERS (*Parasitology, 20 (1928), No. 2, pp. 159–172, pls. 4*).—This is an account of studies made at Stanford University of the swallow bug, an insect of common occurrence in North America, chiefly, if not entirely, upon the cliff swallows, *Petrochelidon lunifrons.* Its habits, structure, and specific characters do not seem to have been adequately studied hitherto. It is stated that the bugs attack man readily, but do not appear to adapt themselves readily to living upon man or in his dwellings.

Two new aleyrodid (citrus) pests from India and the South Pacific, H. L. DOZIER (*Jour. Agr. Research [U. S.], 36 (1928), No. 12, pp. 1001–1005, figs. 5*).—In this contribution from the Delaware Experiment Station the author presents descriptions of two white fly pests that appear to be very serious enemies of citrus in their respective countries, and which would undoubtedly prove to be serious enemies of citrus in this country should they once be introduced. *Dialeurodes (Dialeurolonga) elongata* n. subg. and sp., collected by M. A. Husain at Lyallpur, Punjab, India, on citrus leaves, is described. Notes and descriptions are given of *Aleuroplatus (Orchamus) samoanus* Laing, closely allied to *A. mammaeferus* Q. & B., collected on citron leaves (*Citrus medica*) by F. L. Washburn in his expedition to the Marquesas Islands in the South Pacific in 1926.

Insects and potato virus diseases, K. M. Smith (*Nature* [*London*], *121* (*1928*), *No. 3058, p. 904, fig. 1*).—The author has proved that under glasshouse conditions healthy potatoes on the sprouts of which the green peach aphid carrying the virus of leaf roll has been feeding will produce plants with badly rolled leaves within two months of the date of the first infection, with the result that little or no crop is produced. It is stated that the power of the green peach aphid to transmit potato mosaic is much less, the percentage of experimental infection having been small.

On the inheritance of food habits in the hybrids between the geometrid moths Poecilopsis pomonaria Hb. and P. isabellae Harrison, J. W. H. Harrison (*Univ. Durham Phil. Soc. Proc.*, *7* (*1926–27*), *No. 4, pp. 194–201*).—The author reports upon experiments in which reciprocal matings were made with two geometrids of the genus Poecilopsis.

The larval parasites of the oriental peach moth (Laspeyresia molesta Busck), with special reference to the biology of Macrocentrus ancylivora Rohwer, L. A. Stearns (*New Jercy Stas. Bul. 460* (*1928*), *pp. 24, figs. 4*).—The author reports that during the decade subsequent to the introduction of the oriental peach moth (*L. molesta*) into the United States from Japan about the year 1912 or 1913 it became subject to attack by as many as 47 hymenopterous and dipterous larval parasites, a list of which is presented. At least one of these, *M. ancylivora*, which was first reared from the strawberry leaf roller, must be considered an important factor in reducing annually the infestation in those districts within the Middle Atlantic States in which the pest has become firmly established. The effectiveness of the attack by this parasite continued to increase until in 1925 and 1926 averages of 30 and 31 per cent of all oriental peach moth larvae secured through frequent collection from May 15 to September 15 throughout New Jersey were parasitized by it.

Studies have been made of the biology of this parasite on both the oriental peach moth and strawberry leaf roller under natural and insectary conditions, the details of which are presented. All larval stages of both hosts were found to be attacked. A direct correlation between the rate of development of the parasite and the rate of development of the respective host larvae was determined. The average length of the life cycle of M. *ancylivora* when bred on the strawberry leaf roller showed an excess of 11.5 days directly proportionate to an excess recorded from that host in contrast with the alternate host.

"Each of the three generations of the strawberry leaf roller and four of the oriental peach moth, of normal occurrence annually in New Jersey, are parasitized. Maximum abundance of the hosts and the parasite are coincident. With the first-named host, the first generation is most abundant, whereas with the latter the greatest activity exists during the interval of the second and third generations. Distribution records for New Jersey substantiated by observations elsewhere suggest a definite correlation between altitude or temperature, probably both, and the occurence and relative effectiveness of Macrocentrus and of Glypta (at the present time, second to Macrocentrus in importance), with Macrocentrus operating most effectively at a lower altitude and with a higher mean summer temperature and Glyptra under the reversal of these conditions.

"Cross-parasitism and crossbreeding experiments seem to demonstrate conclusively that Macrocentrus is conspecific from the oriental peach moth and strawberry leaf roller.

"Literature and survey records, which show that the parasite is generally distributed on *L. molesta* but nonexistent on *Ancylis comptana* except in the type locality, indicate that the latter is the occasional rather than the common host of this species."

The spruce tortrix damages ornamental trees, E. I. McDaniel (*Michigan Sta. Quart. Bul., 11 (1928), No. 1, pp. 25, 26, fig. 1*).—The spruce tortrix, *Olethreutes abietana* Fern., which appears to confine its attacks to Englemann spruce and blue spruce, is said to be on the increase all over the State. It is widely distributed throughout the spruce-growing areas of the northeastern United States, from Colorado east to New England. There are two generations each year, the winter being passed either as mature or nearly mature larvae. The larvae start life as leaf miners, and probably pass the winter inside of hollowed out pinnules. In order to afford themselves more complete protection, they web these empty pinnules together. Pupation takes place within the nest where the larvae had fed, in tough, compact cocoons

Cutting off the nests before the adults emerge is said to be the only control measure that has given any satisfactory results, although it is suggested that a dormant application of an oil emulsion or a miscible oil, if applied with pressure, might give some control when applied in the spring before growth starts

Codling moth band experiments, R. H. Smith (*Better Fruit, 22 (1928), No. 11, pp. 12, 13*).—This is a contribution from the California Citrus Experiment Station on the first year's work.

On the immunization of caterpillars of the wax moth against Bacterium galleria No. 2 [trans. title], V. Chorine (*Compt. Rend. Acad. Sci. [Paris], 186 (1928), No. 24, pp. 1659–1661*).—The author finds that it is possible to obtain a very weak asporogenic race of *B. galleria* No. 2. By the administering of a vaccine prepared from an asporogenic culture the caterpillars of this moth may be immunized against the weak race and also the more virulent strain of the organism.

On the specificity of passive immunity in the wax moth [trans. title], V. Zernoff (*Compt. Rend. Soc. Biol. [Paris], 98 (1928), No. 17, pp. 1500–1502*).—A report of further studies of immunity in the wax moth (E. S. R., 58, p. 759).

British mosquitoes and how to eliminate them, A. M. Hogarth (*London: Hutchinson & Co., [1928], pp. 127, pls. 8*).—This is a small, practical handbook.

The leptospiricidal power of extracts of Aëdes aegypti (Stegomyia fasciata), I. J. Kligler and M. Ashner (*Roy. Soc. Trop. Med. and Hyg. Trans., 22 (1928), No. 2, pp. 181–184, pl. 1*).—Experiments are here reported which show that extracts of the yellow fever mosquito possess the power to kill cultures of Leptospira. The leptospiricidal substance is heat labile, passes through a Zeitz filter, and is present in some concentration. Dilutions of 1 in 4 and 1 in 8 are still active against cultures of *L. icteroides.*

Attempts to infect Aedes aegypti (Stegomyia fasciata) of West Africa with Leptospira icteroides by feeding on infected guinea pigs and on culture suspensions, I. J. Kligler (*Amer. Jour. Trop. Med., 8 (1928), No. 4, pp. 283–297*).—The cumulative evidence here presented seems to indicate that *A. aegypti* is not the intermediate host of *L. icteroides.*

The transmission of yellow fever by mosquitoes other than Aedes aegypti, J. H. Bauer (*Amer. Jour. Trop. Med., 8 (1928), No. 4, pp. 261–282*).—This is a report of transmission experiments conducted in West Africa with seven different species of mosquitoes, in which it was found that *A. luteocephalus* and *A. apicoannulatus* were able to transmit yellow fever in all respects in the same manner as *A. aegypti.*

The incubation period of yellow fever in the mosquito, J. H. Bauer and N. P. Hudson (*Jour. Expt. Med., 48 (1928), No. 1, pp. 147–153*).—This is a contribution from the Laboratories of the Commission on Yellow Fever, International Health Division of the Rockefeller Foundation, Lagos, Nigeria, West Africa.

The yellow-fever virus was found in infectious form in the yellow-fever mosquito throughout the entire period of the extrinsic incubation, as demonstrated by the injection of the bodies of mosquitoes into normal rhesus monkeys at daily intervals after the insects had fed on an infected animal. The virus was transmitted through the bite of the mosquitoes, in one experiment on and after the ninth day, and in two experiments on the twelfth day after the initial infecting feed. The pathologic changes produced by the injection of the infected mosquitoes into normal monkeys during the extrinsic incubation were in every respect those of typical experimental yellow fever. The monkeys withstand easily the subcutaneous injection of the mosquito emulsion. No acute inflammatory reaction was observed at the site of injection in any of the 17 animals inoculated with this material in these three experiments.

A contribution to the study of the dipterous parasites of the European earwig (Forficula auricularia L.), W. R. Thompson (*Parasitology, 20 (1928), No. 2, pp. 123–158, pls. 6, figs. 4*).—Following a brief introduction and review of the literature, this contribution from the U. S. D. A. Bureau of Entomology deals with the tachinid parasites *Digonochaeta setipennis* Fall. (pp. 125–147) and *Rhacodineura antiqua* Meig. (pp. 147–154). The account concludes with a brief discussion of these two parasites as controlling factors of the earwig and a list of 29 references to the literature.

In considering these parasites as controlling factors, it is stated that in no earwig collections made in any part of Europe has the mortality from *D. setipennis* exceeded 10 per cent of the population present, and that the mortality from *R. antiqua* has been less than 1 per cent.

The watercress stem-miner, T. H. Taylor (*Ent. Mo. Mag., 3. ser., 14 (1928), No. 162, pp. 126–128, pl. 1, fig. 1*).—This is an account of a dipterous stem miner of water cress which breeds in the south of England, and which is described by Collin in the account noted below as *Hydrellia nasturtii* n. sp.

A new species of Hydrellia (Diptera, Ephydridae) mining the stems of water-cress, J. E. Collin (*Ent. Mo. Mag., 3. ser., 14 (1928), No. 162, pp. 128, 129*).—Under the name *H. nasturtii* n. sp. the author describes the dipteran found by Taylor, above noted.

The giant apple root borer, R. F. Crawford and J. E. Eyer (*New Mexico Sta. Bul. 168 (1928), pp. 8, figs. 6*).—This account of the cerambycid borer *Prionus californicus* Mots., which has long been an enemy of the apple in the Mesilla Valley and other fruit-growing sections of New Mexico, is based upon information collected by F. M. Hull while assistant biologist of the station.

The borer tunnels into the live wood of the roots only. It may be found boring in the crown of the tree, either in the bark or heartwood, and frequently works out quite a way into the roots. The tunnels, frequently 2 in. broad, may extend half way around the tree, sometimes completely girdling it. In heavy soils there are 1 or 2 borers to a tree, in light soils from 10 to 14 are usually present, while as high as 22 borers have been found infesting the roots and crown of apple trees ~~10 to~~ 15 years old. The first evidence of its injury to the apple is a dwarfing and yellowing of the foliage, followed by defoliation and a drying and cracking of the bark of the larger branches, death usually occurring the following season. The heartwood of a tree may be honeycombed by the pest.

After completing their growth early in spring, the larvae leave the tree and begin to construct a "pupation tunnel," which may be over a yard long and is seldom placed at a depth greater than 6 in. Pupation apparently occurs the latter part of May or the first week in June, and the beetles emerge soon afterwards. The borer when full grown reaches a length of 3 in., while the adult beetles are from 1.5 to 2.5 in. in length. While its life history has not been completely worked out, observations indicate that at least 3 years are required to complete its life cycle from egg to adult.

In experiments conducted with paradichlorobenzene, used at the rate of 2 to 4 oz. per tree and placed 5 or 6 in. from the bark to avoid injury, it killed an average of 50 per cent of the borers and did not injure the trees. Since killing was more frequent in the young or newly hatched larvae, it seems advisable to apply the poison during the egg-laying period in June.

Information concerning Japanese beetle traps, F. W. Metzger (*N. J. Dept. Agr. Circ. 146 (1928), pp. 8, figs. 5*).—This contribution from the U. S. D. A Bureau of Entomology discusses the value of traps and describes one type of trap and the bait used in its operation. The use of traps is said to be an efficient and inexpensive means of capturing large numbers of beetles, although the traps do not protect fruit, flowers, or foliage from their attacks.

The potato flea beetle, J. L. Hoerner and C. P. Gillette (*Colorado Sta. Bul. 337 (1928), pp. 20, figs. 14*).—This pest has been of economic importance in Colorado for a number of years, the loss to the potato crop occasioned by it in 1904 having been estimated at $250,000. The rough appearance due to so-called worm tracks produced by the larva on tubers growing in the Greeley section has resulted in a discrimination against potatoes grown in that district.

Studies of its life history and habits are reported upon in connection with a life history chart showing the duration and relative numbers of the different stages of its development throughout the year. The insect winters as an adult in the moist soil at a depth of from 3 to 5 in., the adults appearing from hibernation the latter part of May and early June. In the sections around Greeley and Fort Collins there is one complete generation and a partial second generation, the second brood appearing to be of little importance. Potatoes planted late on the lighter types of well-drained soil are the least liable to be injured.

The beetles avoid sprayed foliage and are very difficult to control by the ordinary applications of insecticides. The results of control work with insecticides in cages are reported upon in detail in tabular form. Calcium arsenate used at the rate of 3 lbs. to 100 gal. of water gave the best control. It should be applied as soon as the beetles become numerous upon the potatoes, usually between June 15 and June 25 in the Greeley district. A second application should be made in about 10 days and, if required, a third application about 10 days later.

Langstroth on the hive and honey bee, rev. by C. P. Dadant (*Hamilton, Ill.: Amer. Bee Jour., 1927, 23. ed., rev. and rewritten, pp. IX+438, pl. 1, figs. [238]*).—This edition of the work previously noted (E. S. R., 47, p. 58) has been revised and rewritten by C. P. Dadant.

Iowa Beekeepers' Association (*Iowa State Hort. Soc. Rpt., 62 (1927), pp. 318–410, figs. 16*).—This is a report of the proceedings of the sixteenth annual convention of the association, held at Ames, Iowa, in November, 1927. Papers presented include the following:

A History of Iowa Beekeeping, by N. Williamson (pp. 323–326); The use of a Weight Scale in the Apiary, by H. B. Parks (pp. 326–331); Controlled Mating in the Honey Bee, by L. R. Watson (pp. 331–337); Parasites of the Beemoth in United States, by F. B. Paddock (pp. 337, 338); Some Effects of

Temperature on Bee Activities, by E. F. Phillips (pp. 338–342); Comparative Value of Some Common Insulators as Winter Packing Material for Bees, by G. E. Marvin (pp. 342–345); Do Italian Bees Serve Our Needs? by F. B. Paddock (pp. 345–347); Charles Dadant's Influence on American Beekeeping, by K. L. Pellett (pp 347–351); The Practical Significance of the Temperature of Bee Flight, by V. G. Milum (pp. 351–355); Fighting the Waxworm, by F. B. Paddock (pp. 355–358); Some Experiences and Lessons Gained from the Chautauqua Platform of Last Summer, by E. R. Root (p 359); Theory and Practice in Beekeeping, by P. Laird (pp. 359–362); Humidity of the Bee Hive, by J. G. Jessup (pp 362–364); Louisiana as a Beekeeping State, by H. A. Stabe (p. 365); Inverted Bee Feeds, by L. E. Dills (pp. 365–369); Roadside Selling, by D. D. Lovejoy (pp. 369, 370); Producing Honey with Package Bees, by A. F. Karsten (pp. 370, 371); Marketing the Crop at Home, by F. Shedtler (pp. 371–373); The Best Race of Bees for Iowa, by F. B. Paddock (pp. 373–379); How Bees Remove Water from Nectar, by O. W. Park (pp. 379–383); Sales Builders, by R. H. Kelty (pp. 383–385); A Small Commercial Planting of Mixed Fruits, by B. S. Pickett (pp. 385–389); and Report of the State Apiarist, by F. B. Paddock (pp. 390–408).

The story of the hive, C. Williams (*London: A & C. Black, 1928, pp. VIII+200, pl. 1*).—This is a popular account.

A manual of bee husbandry, E. G. Carr (*N. J. Dept. Agr. Circ. 53 (1922), pp. 91, figs. 46*).—This is a practical account of beekeeping, particularly as applied to New Jersey conditions

A manual of bee husbandry, E. G. Carr (*New Jersey Stas. Bul. 463 (1928), pp. 87, figs. 44*).—This practical guide is in large part a reprint of New Jersey Department of Agriculture Circular 53, above noted.

Yeasts cause the fermentation of honey, F. W. Fabian (*Michigan Sta. Quart. Bul. 11 (1928), No. 1, pp. 11–13*).—This is a brief practical account based upon Technical Bulletin 92, above noted

Diseases of bees, P. J. Baldensperger (*Les Maladies des Abeilles. Bar France: E. Dumolin, 1928, 2. [ed.], pp. 114+14, figs. [26]*).—This is a second revised and enlarged edition of the work previously noted (E. S. R., 50, p. 633).

Bee diseases and their eradication, M. G. Dadant (*Amer. Bee Jour., 68 (1928), No. 6, pp. 281–283, figs. 2*).—This is a summary of bee disease work in the United States, in which a comparison of the disease situation in the years 1925 and 1927 is graphically shown by comparative maps.

The social world of the ants compared with that of man, I, II, A. Forel, trans. by C. K. Ogden (*London and New York: G. P. Putnam's Sons, 1928, vols. 1, pp. XLV+551, pls. [10], figs. 95; 2, pp. XX+445, pls. [16], figs. 43*).—This is the first English edition of the French work previously noted (E. R. S., 50, p. 260).

A useful parasite of the dried fruit moth, H. Showell (*Jour. Dept. Agr. So. Aust., 31 (1928), No. 11, pp. 1048–1056, figs. 5*).—This is a brief account of *Habrobracon juglandis*, a parasite of the dried fruit moth *Plodia interpunctella* officially known as the Indian meal moth.

Observations on the biology of Rhodites rosae L. and its parasites [trans. title], P. Voukassovitch (*Compt. Rend. Soc. Biol. [Paris], 98 (1928), No. 13, pp. 1148–1150*).—This is an account of observations made in the vicinity of Belgrade during the year 1926.

Synonymy of some species of Eimeria (Emeridia, Sporozoa) [trans. title], C. Pinto (*Compt. Rend. Soc. Biol. [Paris], 98 (1928), No. 17, pp. 1564, 1565*).—A brief contribution on the synonymy of Eimeria.

Are Ascaris eggs in the soil killed by our northern winters? W. A. Riley and W. B Owin (*Amer. Fur Breeder, 1 (1928), No. 3, p. 20*).—The authors' experiments are said to show definitely that winter conditions in Minnesota are not sufficient to kill the eggs of the Ascaris worm of foxes in the soil.

The influence of temperature on the development of Ascaris eggs [trans. title], M. M. Zavadovskiĭ (Zawadowsky) and K. M. Sidorov (*Trudy Lab. Ėksper. Biol. Moskov. Zooparka* (*Trans. Lab. Expt. Biol. Zoopark, Moscow*), *3* (*1927*), *pp. 159–182, figs. 2; Eng. abs., pp. 180–182*).—A report of experiments conducted on the development of eggs of *Toxascaris limbata*, *A. megalocephala*, and *A. suilla*. From 38 to 40° C. was found to be the highest temperature at which the eggs of *T. limbata* and *A. megalocephala* can develop, and from 36 to 38° for the eggs of *A. suilla*. From 6 to 7° was the lowest limit of temperature for the development of eggs of *T. limbata* and *A. megalocephala* and from 7 to 8° for *A. suilla*.

The evolution of Hymenolepis nana [trans. title], J. Bacigalupo (*Compt. Rend. Soc. Biol.* [*Paris*], *99* (*1928*), *No. 21, p. 239*).—A brief account of observations of this parasite, of which the yellow meal worm may serve as an intermediate host, or which may develop directly in the white rat.

ANIMAL PRODUCTION

Growth and development, with special reference to domestic animals.—XI, Further investigations on surface area, with special reference to its significance in energy metabolism, S. Brody, J. E. Comfort, and J. S. Matthews (*Missouri Sta. Research Bul. 115* (*1928*), *pp. 60, figs. 6½*).—Continuing this series of studies (E. S. R., 58, p. 768), the data are presented on the relation of surface area to body size of 482 dairy cattle, 341 beef cattle, 11 horses, and 16 swine. The surface integrator and the method of its use has been previously noted (E. S. R., 56, p. 161). The original data include age, height, condition, area, weight, height at withers, circumference of chest, distance from shoulder to hips, and width of hips. A mathematical analysis is made of these original data, as well as of the available published data on the relation of area to body size and on the relation of heat production to body size.

It is shown that the surface area is directly proportional to some power of the body weight. This power varies from about 0.32 to 0.72, depending on the form of the animal. The changes in form of the animal due to increase in weight during growth have the highest value of the power, and the lowest value of the power is for fattening of mature animals. The use of a prediction formula for estimating the surface area of an individual may involve an error as high as 10 per cent of the true value. It was simpler to relate heat production to a power of body weight or to powers of weight and height than to relate heat production to surface area.

Growth and development, with special reference to domestic animals.—XII, Additional illustrations of the influence of food supply on the velocity constant of growth and on the shape of the growth curve, S. Brody (*Missouri Sta. Research Bul. 116* (*1928*), *pp. 16, figs. 11*).—In this work additional comparisons (E. S. R., 58, p. 460) have been made between age curves of growth of animals under several degrees of normality of food supply. It was found that as the food supply approached an optimum the animal approached mature size more rapidly and the higher was the numerical value of the velocity constant of growth. The mature weight was also increased by the improved food supply, but the relative increase in size was negligible as compared to the relative increase in the speed at which the animal approaches mature weight. The same exponential equation may be used to represent the age curves of the growth of animals on the various food supplies, but the velocity constant, k, differs in value. It is suggested that body weight rather than age be used as a basis for determining the time at which farm animals should first be bred and that dairy heifers be bred when they reach two-thirds of the expected mature weight.

Commercial feeding stuffs. H. R. Kraybill, O. S. Roberts, R. O. Bitler, P. B. Curtis, and C. O. Yund (*Indiana Sta. Circ. 156 (1928), pp. 40, fig. 1*).—A report of 2.870 samples of commercial feeding stuffs collected during the year 1927 and subjected to either microscopic examination or to a complete analysis. The inspection showed that 77 per cent of the samples were equal to or better than the manufacturer's guaranty and that 386 samples were seriously deficient (E. S. R., 58, p. 762).

Analyses of commercial feeding stuffs and registrations for 1928, C. S. Cathcart (*New Jersey Stas. Bul. 471 (1928), pp. 102*).—The found analyses for protein, fat, and fiber of 1,680 official samples of commercial feeding stuffs collected in New Jersey in 1927 are given, as well as a list of the principal ingredients identified in feed mixtures (E. S. R., 57, p. 661).

Progress report of livestock feeding experiment, 1928, E. J. Maynard (*Colorado Sta. Press Bul. 65 (1928), pp. 7, figs. 3*).—Grade calves averaging 376 lbs. in weight were divided into 5 lots of 10 steers each and 1 lot of 10 heifers, and fed for 187 days. All lots received a maximum allowance of 1.25 lbs. per head of cottonseed cake, alfalfa hay self-fed, ground barley, and salt. Lots 1 (steers) and 2 (heifers) also received siloed beet pulp, lot 3 siloed beet pulp and corn silage, lot 4 sugar beet tops, and lot 6 pressed beet pulp. The average daily gains based on market weight were 1.98, 1.74, 1.86, 1.65, 1.94, and 1.98 lbs. per head in the respective lots.

In this test each ton of wet beet pulp replaced 164.4 lbs of ground barley. 1.7 lbs. of cottonseed cake, and 289.8 lbs. of alfalfa hay and reduced materially the feed cost on calves fattened on standard beet by-product rations. Each ton of pressed beet pulp replaced 206 lbs. of ground barley, 2.2 lbs. of cottonseed cake, and 228 lbs. of alfalfa hay. This product stored in a wire inclosure above ground showed a 43.04 per cent loss in weight from time of storing to time of feeding. The wet beet pulp proved more economical than pressed beet pulp, all costs considered. Adding corn silage to the ration reduced the amount of beet pulp necessary to fatten a calf by 42.6 per cent, an important factor where the amount of beet pulp is limited. Although the feeding value of the sugar beet tops was high, it produced too narrow a ration when fed with barley, cottonseed cake, and alfalfa hay for optimum gain or selling price. The steer calves outgained the heifer calves 13.8 per cent at 8.7 per cent less feed cost per 100 lbs. of gain.

Report experiments in finishing baby beef, G. A. Branaman and G. A. Brown (*Michigan Sta. Quart. Bul., 11 (1928), No. 1, pp. 8-11*).—A study of rations for baby beef (E. S. R., 57, p. 865) has been continued, using 3 lots of calves, 5 steers and 5 heifers per lot, averaging approximately 362 lbs. in weight. All lots received as much corn silage as they would consume twice a day, and alfalfa hay was kept before them at all times, as was also a mixture of equal parts of bone meal and salt. Whole oats was fed in equal parts with the grain ration during the first 60 days and at the rate of 1 to 3 parts of other grain for the next 30 days. In addition lot 1 received ground barley, lot 2 shelled corn and linseed meal, and lot 3 shelled corn. For a period of 205 days the average daily gains in the respective lots were 1.97, 2.15, and 1.93 lbs. per head.

Adding linseed meal to the ration in lot 2 increased the average daily gain 0.22 lb. and the selling value 50 cts. per hundredweight over the calves in lot 3. The returns per calf over feed cost were increased $3.69, and the returns per bushel of corn 24 cts. In comparing lots 1 and 3 the gains were practically the same, but the calves fed ground barley were better finished and sold for 25 cts. more per hundredweight. These calves returned $2.56 more over feed cost than those fed shelled corn. All lots, however, returned a fair profit over feed cost.

A technical study of the maintenance and fattening of lambs and their utilization of a ration of alfalfa hay and corn, H. H. Mitchell, W. G. Kammlade, and T. S. Hamilton (*Illinois Sta. Bul. 314* (*1928*), *pp. 29–60*).—In concluding this experiment (E. S. R., 58, p. 356), it was found that 62.3 per cent of the gross energy of a ration of equal parts by weight of alfalfa hay and shelled corn when full fed was metabolizable. When fed at little more than a maintenance level but 59.7 per cent of the energy was metabolizable. In the first ration the metabolizable energy per kilogram of dry matter was 2.794 therms and in the second ration 2.653 therms. Lambs averaging 69 lbs. in weight required 1.53 lbs. of feed and 1,637 calories of metabolizable energy per 100 lbs. of live weight for the maintenance of energy aquilibrium.

The average fat content of the empty carcass of lambs fattened from 65 to 90 lbs. increased from 14.15 per cent, as determined in lambs slaughtered at the beginning of the test, to 24.89 per cent at the end of the test. The average gain in empty weight was calculated to consist of the following: Dry matter 73.1 per cent, protein 11.9, fat 53.6, and ash 2.5 per cent. The gross energy of each pound of gain was 2.63 therms. It was impossible to show an increase in the calcium content during fattening since 65 per cent of the increase in ash occurred in the wool and largely represented outside contamination. The percentage of calcium in the ash of the entire carcass of the check lambs ranged from 27.4 to 28.5, in the fattened lambs 22.3, and in the maintenance lambs 24.4.

The gain in nutrients of the fat lamb carcass was made up of 66.7 per cent of the dry matter, 54.8 per cent of the protein, 71.4 per cent of the fat, and 69.6 per cent of the gross energy. The wool growth represented 8.8 per cent of the dry matter gained, 26.3 per cent of the protein, 2.1 per cent of the fat, and 5.2 per cent of the energy. The daily wool growth of these young lambs contained per 1,000 lbs. of live weight 0.086 lb. of protein and 377 calories. The daily gain of energy by these lambs averaged 568 calories. The average intake of metabolizable energy was 2,427 calories per day, of which 1,254 calories were estimated to be needed for maintenance. From this it is calculated that 48.5 per cent of the metabolizable energy apparently available is stored by the animals.

[Experiments with swine at the Williston Substation], E. G. Schollander (*North Dakota Sta. Bul. 219* (*1928*), *pp. 24–26, figs. 2*).—In tests with hogging down crops 14 pigs averaging 98.6 lbs. per head were turned into a field consisting of 0.9 acre of peas and 1.81 acres of Gehu corn. They were fed a limited amount of skim milk per day. In 48 days the pigs made an average daily gain of 2.08 lbs. per head and produced 516.6 lbs. of pork per acre. After deducting the value of the skim milk each acre of peas and corn made a net return of $48.64.

After October 24, the date on which the standing crops were exhausted, the pigs were fed in pens on husked ear corn and skim milk. During 17 days on this ration 4 pigs were sold and their gains added to the total gain of the lot, which was 468 lbs., or 2.21 lbs. of gain per pig per day. It required 5.3 lbs. of corn plus the skim milk to produce a pound of gain. After deducting the cost of corn and skim milk, the net receipts left for care and feeding were so small as to be considered negligible. It was deemed wise from these results to allow pigs to husk their own corn.

On November 10, 8 of the pigs, averaging 227 lbs. per head, were fed ground barley and skim milk until sold. On this ration they made an average daily gain of 2.03 lbs. per head, requiring 4.94 lbs. of ground barley and skim milk per pound of gain. Again, after deducting the cost of feed, the amount left for care and feeding was so small as to indicate that allowing pigs to do their own feeding in the field was the better plan.

Pigeons and how to keep them, A. H. Osman (*London and New York: Cassell & Co., 1925, pp. XIII+114, pls. 8, figs. 5*).—This is a practical account.

DAIRY FARMING—DAIRYING

Hay is necessary in ration for dairy cattle, C. F. Huffman (*Michigan Sta. Quart. Bul., 11 (1928), No. 1, pp. 3–6, figs. 4*).—Continuing this study (E. S. R., 59, p. 466), it was found that cattle fed hay or grass and little or no concentrates produced an alkaline urine, while those fed concentrates produced an acid urine. A calf was raised to 500 days of age on whole milk and 20 cc. of sirup of iron phosphate per day and remained normal. Another calf receiving 15 cc. of sirup of iron phosphate per day was 109 per cent normal in weight at 405 days of age, but died of convulsions at 413 days. Other calves fed concentrates and sirup of iron phosphate have failed to manifest convulsions, but the addition of 2 gm. of ferric phosphate per day to a concentrate ration has failed to prevent convulsions.

Over a long period of time a ration of grain, silage, and timothy hay has been found satisfactory for growth, reproduction, and milk production in dairy cattle. However when 4 heifers were placed on such a ration except that wheat straw replaced the timothy hay all produced abnormal calves at their first gestation. Most of the calves were blind at birth and died shortly after of convulsions. The straw apparently had no effect upon the growth or oestrous cycle of the 4 heifers. One cow consumed a large quantity of straw during her second gestation period and produced a normal calf at this time.

The results indicate that both the quantity and quality of the hay are important in maintaining health and reproduction in dairy cattle.

Study of bull associations in Idaho, H. A. Mathiesen and F. W. Atkeson (*Idaho Sta. Bul. 161 (1928), pp. 62, figs. 13*).—The results of a survey of 18 cooperative bull associations of the State to obtain information on the improvement of the producing abilities of the dairy cows through the use of better bulls and on the organization and management of the associations are recorded.

The study has shown that the cooperative associations have reduced the investment in bulls per man and per cow, the risk of capital, and the cost of maintaining the bull. The associations supplied better bulls and tended to standardize the breed of dairy cattle in that locality. The production of 48 daughters by 16 association bulls was 23.2 per cent greater in fat than that of their dams. The heifer calves of the association bulls sold for higher prices than calves sired by other bulls in the locality. The associations tended to develop better dairy practices.

The methods of organization and management are an important phase in the success of bull associations, but the methods in use at the present time were not found to be ideal and warrant considerable study for future success.

Whey butter, E. S. Guthrie (*New York Cornell Sta. Bul. 468 (1928), pp. 12*).—This study was undertaken to ascertain the standing-up qualities and the keeping properties of whey butter. The whey was separated as soon as possible after it was drained from the cheese vat and standardized with skim milk to a composition of about 30 per cent fat. After separation, it was divided into two parts, one of which was pasteurized at 150° F. for 30 minutes, while the other part was cooled to 50° while raw, and both placed in the refrigerator. This process was repeated the second day, and the portion that had been pasteurized on the first day was mixed with half of the fresh cream and the combined lot pasteurized. The other half of the fresh cream was pasteurized after it had been added to the cream that had been cooled the preceding day. The "cooled cream" and the "pasteurized cream" were then divided into two equal portions and a commercial starter introduced into one portion of each class. This portion was ripened at 70°, then cooled and placed in the refrigerator until all lots were churned the following day. A comparison of regular cream butter and whey cream butter in ripening, pasteurization, melting point, and score was made.

It was found that the sweet whey cream butter retained its flavor better than did the ripened product, and lost but 0.44 point in score while the ripened product lost 1.60 points. There was little difference in the keeping quality of the cooled cream and pasteurized cream butter when both were pasteurized the day before churning. The total loss on both sweet and ripened regular cream butter was 2.14 points and for comparable whey butter 1.06 points. However, the regular cream butter showed a superiority of 0.48 point over the whey product. The mixed regular and whey cream butter was 0.08 point better than the check in holding qualities. The Price ratio score showed a superiority of 4.54 points for the regular product over the whey product, but the mixed regular and whey cream butter was 0.49 point better than the product from the regular cream. The Perkins reading (E. S. R., 32, p. 413) showed the regular butter to be 0.23 point softer than the whey butter, and the mixed regular and whey cream butter to be 0.37 point firmer than the regular cream butter. The regular cream butter had a score of 0.1 point higher for body than the whey butter and 0.04 point less than the mixed regular and whey cream butter. There was little difference in the firmness of the whey, mixed cream, and regular butters.

The author concludes that the difference in keeping quality of whey and regular butter is insignificant, and that there was practically no difference in the flavor or body of the two. No bad effects resulted from mixing whey and regular cream of equal quality.

VETERINARY MEDICINE

Report of the New York State Veterinary College at Cornell University for the year 1926–1927 (*N. Y. State Vet. Col. Rpt. 1926–27, pp. 224, figs. 25*).—The reports of clinics and research presented in the appendix to this report (E. S. R., 58, p. 272) include the following:

Report of the Diagnostic Laboratory for the Year Ending June 30, 1927, by C. M. Carpenter, C. J. Parshall, and D. W. Baker (pp. 41–53); Report of the Diagnostic Work on Poultry Diseases at Ithaca, July 1, 1926, to June 30, 1927, by E. L. Brunett and W. E. Brandner (pp. 54–56); Report of the Poultry Disease Laboratory at Farmingdale, Long Island, July 1, 1926, to June 30, 1927, by J. M. Hendrickson and H. M. Devolt (pp. 57–63); The Diagnosis and Treatment of Traumatic Gastritis in Cows, by R. H. Bardwell and D. H. Udall (pp. 64–74); Diseases of the Digestive Tract, by H. J. Milks (pp. 75–81); The Physiology of Milk Fever, by P. A. Fish (pp. 82–99) (E. S. R., 57, p. 874); The Blood Sugar of the Cow in Milk Fever, by C. E. Hayden (pp. 100–107); Some Suggestions regarding the Handling of Bang Abortion Disease, by R. R. Birch and H. L. Gilman (pp. 108–118); Immunizing Young Pigs against Hog Cholera, V, by J. W. Benner (pp. 119–130); Experimental Bracken Poisoning of Cattle, by W. A.

Hagan and A. Zeissig (pp. 131–143) (E. S. R., 57, p. 873); The Gins Method of Demonstrating Capsules of Bacteria, by W. A. Hagan (pp. 144, 145); A Study of Milk from Cows showing No Agglutinins for *Brucella abortus* in Their Blood Serum, by C. M. Carpenter and C. J. Parshall (pp. 146, 147) (E. S. R., 57, p. 874); The Natural Dissemination of Abortus Infection, by C. M. Carpenter (pp. 148–152); A Study of *Brucella abortus* Infection in Milk from Fifty Herds Supplying the City of Ithaca, New York, by C. M. Carpenter and D. W. Baker, (pp. 153–163) (E. S. R., 57, p. 874); A Study of the Diseases of the Cottontail, *Sylvilagus floridanus* (Miller), of New York State, by C. A. Lueder (pp. 164–182); Fat Absorption and Assimilation in Poultry as Determined by the Darkfield Microscope and a Fat Soluble Dye, by C. E. Hayden and P. A. Fish (pp. 183–197); Why Veterinarians Should Be Interested in Poultry Disease Control, by J. M. Hendrickson (pp. 198–206); The Veterinarian's Relation to the Poultry Situation, by J. M. Hendrickson (pp. 207–213); and Rabies and Its Control, by V. A. Moore (pp. 214–221).

[The first, second, third, and fifth reports of the Chosen Government Institute for Veterinary Research] (*Chosen-Sohtokufu Inst. Vet. Med. Research, Fusan, Rpt., 1 (1922), pp. [143], pl. 1; [Chosen] Govt. Inst. Vet. Research Rpts., 2 (1924), Eng. abs. pp. 1–11; 3 (1925), Eng. pp. 1–48, figs. 13, Ger. abs. pp. 49, 50, Eng. abs. pp. 51–53, Ger. abs. pp. 54–56; 5 (1928), Eng. abs. pp. 1–21, Ger. abs. pp. 22, 23*).—The first report, which is in Japanese, contains the following contributions: Experimental Studies on the Vaccination against Rinderpest, II, by C. Kakizaki; On the Applicability of the Precipitin Reaction for Demonstration of the Heterogeneous Protein Which Is Contained in Organs of Cattle Afflicted with Rinderpest: A Serum Diagnosis for Rinderpest, by S. Kawamura; Contribution to the Knowledge Concerning the Cause of Jaundice, by H. Morita; Studies on the Complement Fixation Test for Rinderpest with Heated Antigens, by G. Mizuki; On the Value of Application of Rabbits as Culture Media for subcultivation of the Seed Virus of Cowpox, by Y. Kawasaki; and A Case of Calf Septicemia Attributed to a Member of the Group of *Bac. enteritidis* Gärtner Which Has Never Been Reported in Japan, by Konno, Mogami, and Yamaga.

The contributions in the second report are as follows: Phylogenical Studies on the Cattle in Eastern Asia Excluding Japanese Islands, by T. Mochizuki (p. 1); Studies on Complement Fixation Tests on Rinderpest with Heated Antigens, by G. Mizuki (pp. 2, 3); Newly Discovered Fowl Plague in Japan (Plague Similar to "Hühner Typhus"), by T. Konno (pp. 4–6) (E. S. R., 53, p. 82); and Case of Generalized Cysticercosis of Korean Calf, by S. Nakanishi (pp. 7–11).

The papers in the third report are as follows: Experimental Studies on the Prophylactic Inoculation against Rinderpest, II, by C. Kakizaki (pp. 1–48); On Bacillary White Diarrhea of Chickens in Chosen, by T. Konno (pp. 49, 50); Experimental Studies on the Effects of Polished Rice Feeding and Its Vitamin B Defect in the Horse, by K. Naito, T. Shimamura, and K. Kuwabara (pp. 51–53); Pathological Anatomy of Contagious Pleuropneumonia (Pleuropneumonia Bovis Contagiosa) of Cattle in Chosen, by T. Kimura, T. Fukushima, T. Fujii, and T. Konno (pp. 54–56).

The fourth report has been noted (E. S. R., 58, p. 472).

The contributions in the fifth report are as follows: Experimental Studies on the Economical Rinderpest Vaccine, by C. Kakizaki, S. Nakanishi, and J. Nakamura (pp. 1–12); On the Minimal Lethal Doses of the Rinderpest Virus, by G. Mizuki and M. Sasaki (p. 13); On the Effect of Glycerin and Carbolic Acid upon the Vaccine Virus, by T. Matsumura (p. 14); Comparative Studies on the Histo-pathological Changes of the Endings of the Motor Nerves in Domestic Animals, by T. Fukushima (p. 15); A Case Report of B-avitaminosis of a Pony Due to Long Feeding upon Vitamin B Deficient Diet, by K. Naito, T. Fukushima, and T. Fujii (pp. 16, 17); Comparison of Germanin and Naganol in the Antitrypanosomal and Antispirochetal Activities: Behavior of *T. gambiense*, *T. evansi*, and *T. equiperdum* against the Prophylactic Action of "Bayer 205," by S. Akazawa (pp. 18, 19); The Vacillation of the Wassermann and Sachs-Georgi Reactions in the Experimental Trypanosomiasis of Animals, by K. Kasai and S. Akazawa (pp. 20, 21); and On the Effects of Polished Rice Feeding and Its Vitamin B Defect in the Horse, II, by K. Naito, T. Shimamura, and K. Kuwabara (pp. 22, 23).

The occurrence of multiple zones in the serum precipitation reaction, N. E. Goldsworthy (*Jour. Path. and Bact., 31 (1928), No. 3, pp. 525–539*).—"The method of optimal proportions in the precipitation reaction has been extended so that a very wide range of ratios between antigen and antibody is secured. The occurrence of multiple zones of rapid particulation has been demonstrated with some antisera. The position of the supernumerary zones within a series of mixtures of antigen and antiserum has generally been in those mixtures where the amount of antigen was excessive relative to the amount in the optimal mixture."

The commonest forms of actinomycosis in domestic animals and their etiology, H. Magnusson (*Acta Path. et Microbiol. Scand., 5 (1928), No. 2–3, pp. 170–245, figs. 21*).—The author here includes reports upon 135 cases of the disease in cattle and 273 in pigs collected and examined during the years 1922–1928 in Sweden. He has retained the old name actinomycosis, but shows that the cause of the disease is far from being uniform. "Only 41 per cent of the cases in bovines were due to Streptothrix. While bovine actinomycosis of the jaw, with its rarefying ostitis (48 cases), was almost always a Streptothrix infection and thus has still the right to bear the old classical name actinomycosis, 'wooden tongue' (22 cases) and actinomycosis of other soft parts, such as lymphatic glands, gums, hard palatal mucous membrane, mouth and skin, were for the most part an actinobacillosis (33 cases). In actinomycosis of the udder in cows (3 cases) it was always a staphylococcus infection and the process in an etiological respect identical with botryomycosis. In pigs the diseases has only occurred in the form of actinomycosis of the udder, 181 cases, 66.3 per cent, being due to Streptothrix and 41 cases, 15 per cent, being due to staphylococci. The granules from staphylococcus actinomycosis in pigs may at the same time exhibit clubs and capsules, and the process thus appears at one and the same time to be actinomycosis."

The author found that by the agglutination test it is possible to fix a differential diagnosis between actinobacillosis on the one hand and tuberculosis and Streptothrix infection on the other. It is pointed out that actinomycosis of the tongue, esophagus, larynx, and lymphatic glands may easily be mistaken for tuberculosis. It is considered probable, although not proved by tests on animals, that *Bacillus pyogenes* can also develop granules and be the cause of actinomycosis. The staphylococci isolated from an actinomycosis of the udder of a cow and of a sow are identical with the common suppurative staphylococci.

A list is given of 43 references to the literature.

[Anaplasmosis in the United States], M. C. Hall (*Jour. Parasitol., 14 (1928), No. 3, pp. 199, 200*).—In this brief paper, presented at the meeting of the Helminthological Society of Washington held in October, 1927, the author calls attention to the occurrence of anaplasmosis in the United States, referring to its appearance in Kansas, Louisiana, California, Florida, and Oklahoma.

Accounts of the occurrence of this disease in the United States by Boynton (E. S. R., 59, p. 79) and by Giltner and Stiles (E. S. R., 59, p. 369) have been noted.

Remarks on the foot-and-mouth disease epizootic in Denmark, C. O. Jensen (*Acta Path. et Microbiol. Scand., 5 (1928), No. 2-3, Sup., pp. 105-107*).—This is a brief discussion of the epizootic which prevailed in Denmark from October, 1924, and had not run its full course at the end of December, 1926.

In 1924–25 reconvalescent serum was used to a considerable extent in order to produce a milder course of the disease, and especially to prevent the fatalities among calves and young pigs. The result was altogether satisfactory, particularly with the very young animals, but at the onset of the outbreak in 1926 the serum of 1925 proved completely inactive. The reconvalescent serum from the new cases was, however, very active from the start and remained so throughout the year.

Attention is drawn to the demonstration by Vallée and Carré in 1922 of the existence of different types of foot-and-mouth disease virus, giving different serological reactions, namely, virus A and virus O. It is considered probable that the outbreaks of the disease in Denmark in 1924-25 and 1926 were two separate epizootics, each caused by its own type of virus, since one type does not immunize against the other. The experimental work conducted at Strasbourg University by Schoening and Traum, members of the American commission on foot-and-mouth disease, with material furnished, led to the conclusion that the earlier outbreak was due to virus O and the later to virus A.

In a discussion of the paper which follows (pp. 107, 108), H. Magnusson points out that the stamping-out method of combating the disease has been successfully applied in seven outbreaks in Sweden since 1898, although this method had to be discontinued in 1925 as applied to the extreme southwest corner of that country.

Rinderpest, with special reference to its control by a new method of prophylactic treatment, W. H. Boynton (*Philippine Jour. Sci., 36 (1928), No. 1, pp. 1-35, pls. 3*).—The author reports that from the large number of animals that have been protected it is evident that a potent vaccine against rinderpest can be made from certain body organs of animals suffering from this disease.

"The lymphatic tissues are of primary importance as components of this vaccine. Although the liver, heart, kidneys, and blood contain an abundance of virus, they are not suitable, either separately or collectively, for the production of vaccine; but, when these tissues are added to the lymphatic tissues, a potent vaccine can be produced from the entire mass. The virus of rinderpest is thermolabile, and a temperature of over 44° C. is detrimental to the vaccine if such temperature is held for any length of time.

"Animals immunized by the vaccine treatment do not undergo any noticeable systemic reaction. They can be worked every day and cohabit with susceptible animals without detriment to themselves or to the animals with which they come in contact.

"In the neighborhood of 6,000 cc. of vaccine can be obtained from one virus animal. This amount is sufficient to protect 1,000 or more animals, depending on the titration of the vaccine. Thus, by the vaccine treatment, we have developed a safe and inexpensive method of protecting animals against rinderpest. In using the vaccine in rinderpest-infected areas, it is essential to combine the vaccine treatment with quarantine measures. When vaccine is applied to animals in rinderpest-free areas, there is no need of the enforcement of quarantine. It is advisable to have all animals revaccinated every two years.

By the use of the vaccine, rinderpest has been eradicated from certain localities in the Philippine Islands where the disease had resisted all other measures of control."

Skin tests with human, bovine, and avian tuberculin [trans. title], C Sorrentino (*Pediatria [Naples], 35 (1927), p. 1329; abs. in Jour. Amer. Med. Assoc., 90 (1928), No. 7, p. 577*).—In tuberculin tests of 185 children with clinical signs of tuberculosis 60 per cent reacted to the human type, 49.2 per cent to the bovine type, and 3.8 per cent to the avian type. Of 215 children in which there were no clinical signs of tuberculosis, 21 per cent reacted to the human type, 33.2 per cent to the bovine, and 8 per cent to the avian. Of 156 children found positive to the human type 75.6 per cent were equally positive to the bovine type, while of 215 children found negative to the human type 18.6 per cent proved positive to the bovine type.

It is pointed out that in testing with the several types of tuberculin the specific reaction to the tuberculin belonging to the strain that caused the infection and the general group reaction to the other tuberculins must be distinguished, the former appearing earlier and being more intense.

The bacteriology of contagious abortion of cattle and of undulant fever in man, G. R. Ross (*So. African Jour Sci., 24 (1927), pp. 282–288*).—The author discusses the bacteriological relationship between *Brucella melitensis* and *B. abortus*, the isolation of *B. abortus* from human sources, and undulant fever in Southern Rhodesia; reports upon the bacteriological and serological investigation of cases; and presents a discussion on contrasting epidemiology of *B. melitensis* and *B. abortus* infections.

A survey of the developments of research into bovine contagious abortion during the period 1895–1928, III, IV, A. W. Holtum (*Vet. Jour., 84 (1928), Nos. 637, pp. 342–350; 638, pp. 414–422*).—These are in continuation of the parts previously noted (E. S. R., 59, p. 674).

Further studies in the etiology of milk fever, H. Dryerre and R. Greig (*Vet. Rec., 8 (1928), No. 36, pp. 721–726, figs. 4*).—The authors find that the blood calcium values for normal cows do not appear to present any difference from those of cows in advanced stages. "The onset of milk secretion appears to be accompanied by a transient but appreciable fall in the blood calcium, which returns to normal after the crisis of initiation of lactation has passed.

Milk fever is usually associated with an increase in blood glucose (hyperglycemia), but this does not seem to be of any special significance. In milk fever there is, invariably, a pronounced fall in the blood calcium (hypoglycemia). The degree of severity of the symptoms is in inverse ratio to the calcium level in the blood. Inflation of the mammae of normal lactating ewes causes a rise in the blood calcium (about 10 per cent). Inflation of the mammae of the cow in cases of milk fever results in a pronounced rise in the blood calcium. The rise is at first rapid, and the case usually shows definite signs of recovery when a level of about 6 mg. of calcium percentage has been reached. Two determinations suggest that the peak of the rise is not reached until the fourth or fifth day after inflation (when a hypercalcemia obtains), after which the calcium returns to normal. Evidence is produced which warrants the adoption of calcium therapy in the prevention and cure of milk fever."

Parasites injurious to sheep, L. Stevenson (*Ontario Dept. Agr. Bul. 337 (1928), pp. 29, figs. 23*).—This is a compilation of practical information on the important parasites of sheep.

A quantitative study of the influence of oxygen and temperature on the embryonic development of the eggs of the pig ascarid (Ascaris suum Goeze), H. W. Brown (*Jour. Parasitol., 14 (1928), No. 3, pp. 141–160, figs. 8*).—

The author reports upon a study of the embryonic development of the eggs of *A. suum* incubated in 1–1,000 formalin-tapwater medium. Development was found to be very regular at both 21 and 30° C. in media saturated with atmospheric oxygen, approximately 6.4 and 5.2 cc. of oxygen per liter, respectively.

"Development is 2.5 times as rapid at 30° as at 21°. Each stage of development is hastened equally by this 9° raise in temperature. Oxygen consumption by the developing eggs is very regular; no one stage consumes more than any other stage. Oxygen consumption by eggs developing at 21° is slower than that of eggs developing at 30°, due to the slower development of the eggs at the lower temperature. The amount of oxygen consumed by eggs to develop to any given stage at these two temperatures is identical. Completely embryonated eggs consume oxygen more slowly than developing eggs, and the consumption of oxygen by embryonated eggs at 30° is nearly twice as rapid as that of eggs at 21°. A single Ascaris egg consumes about 0 0000025 cc. of oxygen during its development. Eggs in the morula, tadpole, and embryonated stages can completely exhaust oxygen from their culture medium.

"Embryonic development proceeds normally in media deprived of as much as one-half of the oxygen found in water saturated with atmospheric oxygen at 30°. In media with approximately 1.3 to 1.8 cc. of oxygen per liter at 23°, development is retarded about 30 per cent. At this same temperature the embryonic development is retarded 50 per cent in media with about 1.1 cc. of oxygen per liter. At 30° media with 1.8 to 3.0 cc. oxygen per liter permit development at a normal rate, while in media with 1.3 cc. and 0 9 cc. oxygen per liter development is slowed down approximately 30 and 50 per cent, respectively. Oxygen pressures do not hasten embryonic development, and when sufficiently great (506 mm.) prove lethal to the developing embryo in the very early stages of development."

Notes on the eggs and larvae of the thorny-headed worm of hogs, H. W. Manter (*Amer. Micros. Soc. Trans., 47 (1928), No. 3, pp. 342–347, pl. 1*).—The author here reports upon observations made of *Macracanthorhynchus hirudinaceus* (Pall.) on material collected in Louisiana, where it is a very important parasite. The author finds that chemicals are not needed to induce hatching when the eggs are obtained from the body of a mature worm, since many of these contain fully developed infective larvae. By allowing a culture of these eggs in water to dry completely, and then rewetting with water, numbers of the eggs will hatch immediately. It was found that no hatching takes place even after long periods of time if the eggs are allowed to remain in the water without drying.

An occurrence of equine abortion on the island of Hokkaido in the north of Japan [trans. title], K. Kasai, C. Kohanawa, K. Ogura, and S. Ito (*Jour. Cent. Vet. Assoc. Japan, 39 (1927), No. 7, pp. 619–668; abs. in Vet. Jour., 84 (1928), No. 633, pp. 143–145; Trop. Vet. Bul., 16 (1928), No. 2, pp. 58, 59*).—A report is given of a study, with bacteriological examinations, made on the island of Hokkaido where the disease has prevailed since 1921.

The pathology of bacillary white diarrhea in chicks, L. P. Doyle and F. P. Mathews (*Indiana Sta. Bul. 323 (1928), pp. 16, figs. 7*).—A study of this disease extending over several years, during which time gross examination of hundreds of chicks has been supplemented by bacterial examinations, has led the authors to conclude that the disease has a remarkably definite pathology and can usually be diagnosed solely by the gross lesions. The only cases in which lesions of white diarrhea have been found in the absence of demonstrable *Bacterium pullorum* infection have been instances in which some other paratyphoid organism, such as *B. gallinarum*, was the infecting agent.

The lesions of the disease in chicks occur in the liver, lungs, heart, ceca, and gizzard. The intestine apparently does not show characteristic lesions. The liver in chicks a few days old is enlarged, congested, and contains hemorrhages and yellowish foci. In older chicks it contains gray foci. Any type of pneumonia in chicks strongly suggests white diarrhea. Gray or yellowish nodules in the lungs can be considered pathognomonic of the disease. Gray nodules in the heart wall and in the gizzard are very reliable lesions of white diarrhea.

The microscopic changes which characterize white diarrhea are focal degeneration and necrosis in the liver, followed by accumulations of endothelial leucocytes; and infiltration, mainly focal, of the lungs by mononuclear leucocytes which frequently undergo necrosis, giving rise to areas of caseation necrosis. The heart and gizzard lesions are made up mainly of mononuclear leucocytes. The exposure of chicks to dust containing *B. pullorum* caused typical lung lesions of bacillary white diarrhea. The microscopic structure of these lung lesions was found to be distinctly different from that of the lesions of pulmonary aspergillosis in chicks.

Incidence of cloudy reactions in agglutination tests for Salmonella pullorum infection, G. S. and S. J. Schilling (*Jour. Infect. Diseases, 43 (1928), No. 2, pp. 172-180, fig. 1*).—The first part of this contribution from the Arkansas Experiment Station consists of a brief review of earlier observations and work with the cloudy reactions met with in making the agglutination test for *S. pullorum* infection of the fowl.

The data obtained are considered to show clearly that the cloudy reaction tends to appear earlier than the agglutination reaction, and that since the cloudy reaction tends to persist a selection of the time of reading does not offer a means of avoiding the interference of this nonspecific precipitation. The studies led to the conclusion that the condition of the serum is no reliable criterion by which to predict whether or not a given serum will produce a cloudy reaction. When hemolysis is present in addition to varying amounts of precipitates in the blood serums, the frequency of nonspecific reactions is increased. The time of appearance of precipitates in the blood serum of fowls is highly variable, and no correlation was found as between the presence of precipitates in the serum and the appearance of a cloudy reaction.

It was found that sex is not a controlling influence in determining the incidence of the cloudy reaction, since the blood serums from 6.1 per cent of 243 male birds available gave cloudy reactions and 23.2 per cent of the blood serums from 2,981 female birds. These records were gathered from tests that were made prior to the breeding season. However, in one group 20 per cent of 50 males and only 15 per cent of the 323 females gave cloudy reactions.

It is concluded that the incidence of cloudy reaction is quite variable as between blood samples of different flocks, rarely occurring or being absent in some instances and occurring in as high as 75.5 per cent of others. It was found that the breed of birds does not clearly influence the incidence of the cloudy reaction, although on the whole, light breeds in the work reported yielded higher percentages of cloudy reactions. The percentage of cloudy reactions among the bloods of pullets appeared to approximate that observed in the bloods of hens so closely that the age of the bird can not be regarded as a controlling factor.

The effect of chemicals in the control of poultry diseases.—II, An attempt to control fowl typhoid and bacillary white diarrhea with certain hypochlorite solutions, G. A. Cruickshank and H. G. May (*Poultry Sci., 7 (1928),* No. 4, pp. 156–162).—This is a second report of investigations conducted at the Rhode Island Experiment Station (E. S. R., 56, p. 574).

"A study of three commercial hypochlorite preparations and of ordinary bleaching powder failed to show any effectiveness of these materials in reducing mortality of chicks artificially infected by *Salmonella pullorum* and *S. gallinarum*. These substances show no apparent germicidal action in the alimentary tract. They do, however, act as efficient disinfectants of the drinking water, and apparently will prevent the spread of the intestinal diseases by this route. The incubation period seems to be the same for both fowl typhoid and bacillary white diarrhea. This appears to be from 4 to 7 days after infection. *S. pullorum* and *S. gallinarum* are destroyed in the same time period by equal concentrations of hypochlorite solution. The hypochlorites are recommended as a means of preventing the spread of fowl typhoid and bacillary white diarrhea through the drinking water."

Cutaneous immunity in relation to contagious epithelioma, N. J. PYLE (*Massachusetts Sta. Tech. Bul. 14* (1928), *pp. 201–216*).—This is a report of investigations conducted in continuation of those previously noted (E. S. R., 56, p. 381), in which it was shown that the powdered pox virus and other vaccines produced a slight degree of immunity but not sufficient to protect very fully against the disease under all conditions.

The author first reports upon serological studies on normal and immune birds which demonstrate that a specific antibody concentration in the blood serum of immune fowls is not the sole protective force against contagious epithelioma. This is followed by immunity experiments which demonstrate that a cutaneous immunity is the chief protective force against the disease. This was shown by the development of lesions containing pox virus at the point of inoculation and on the comb and eyelids after the subcutaneous administration of the triple strength vaccine, which was followed by a complete immunity.

The experiments conducted with local or cutaneous vaccines included work on their standardization. "Various vaccines were applied to scarified comb areas and injected into the barbs of the comb; also to scarified areas of denuded feather follicles and interfollicular skin surface on the leg just above the tibio-femoral joint. Unfavorable reactions followed. The vaccines were then applied to the denuded feather follicles, without previous scarification or cleansing, by rubbing them directly into the follicles with a cotton swab attached to a wooden applicator or a pared down camel's hair brush. A cutaneous vaccine containing 200 mg. of virus suspended to 50 cc. of a 40 per cent glycerol-physiological saline solution (2 parts glycerol and 3 parts saline) always caused a swelling of the feather follicles followed by the development of scabs over the orifices of the follicles. This vaccine always produced a complete immunity of a cutaneous nature after the development of the local pox eruption. Additional experiments showed that this cutaneous vaccine always produced the local pox eruption, which was essential to the development of a complete immunity, but its administration was followed by a decrease in egg production. It was also determined that complement-fixing antibodies were not produced during the development of cutaneous immunity against contagious epithelioma.

"A tentative standard for the cutaneous vaccine was adopted. The virus to be used should have an incubation period of from 4 to 7 days and, therefore, must be less than 1 year old. The vaccine should contain 200 mg. of such a virus suspended in 50 cc. of a 40 per cent glycerol-physiological saline solution. The product should not be attenuated by heat. It should be used within 25 days after its manufacture, preferably within 10 to 15 days, because it does not always produce a complete immunity when older. If continuous ice-box storage is not available, 0.5 per cent phenol should be added as a preservative."

AGRICULTURAL ENGINEERING

The ascendency of applied science in the industry of agriculture, O. B. Zimmerman (*Agr. Engin., 9 (1928), No. 7, pp. 201–205, figs. 5*).—This is the address of the president of the American Society of Agricultural Engineers at the annual meeting of the society at Washington, D. C., June, 1928 (E. S. R., 59, p. 402).

Some relations between evaporation, precipitation, and run-off, W. J. Humphreys (*U. S. Mo. Weather Rev., 56 (1928), No. 5, pp. 177, 178*).—The author deduces mathematical expressions of the relations between evaporation, precipitation, and run-off for (1) the world as a whole, (2) all land areas jointly, and (3) a restricted area, such as a given watershed.

Precipitation, evaporation, and run-off, W. J. Humphreys (*U. S. Mo. Weather Rev., 56 (1928), No. 5, p. 178*).—A brief critical mathematical analysis is given.

The source of the water vapor of the atmosphere: A criticism, A. J. Henry (*U. S. Mo. Weather Rev., 56 (1928), No. 5, pp. 176, 177*).—This is a criticism of the findings of others, it being concluded from computations that the total amount of water drawn from the deep earth supply is negligible when compared with the total rainfall of the globe. "At best the water so used is lumped with total evaporation and serves to make that quantity slightly larger than it should be."

Economic fuels for internal-combustion motors [trans. title], **M. Cordier** (*Tunisie Agr., n. ser., 27 (1926), No. 7, pp. 105–120*).—A general review and discussion of suitable substitutes for gasoline for use in internal-combustion engines on farms is presented. It has been found that using poor fuel in an ordinary gasoline engine results in a loss of about 30 per cent of power. Efforts were made to purify poor fuel by reducing the speed of the gas as it enters the engine.

Power and labor studies in Pennsylvania, H. B. Josephson (*Agr. Engin., 9 (1928), No. 7, pp. 219–223, figs. 6*).—This is a progress report of studies at the Pennsylvania Experiment Station, the purpose of which is to reduce the power and labor requirements of the operations involved in corn, oats, wheat, hay, and potato production and in tillage to a profitable minimum by engineering procedure. A detailed analysis of the power and labor requirements of each operation is presented.

It was found that when a general-purpose tractor was substituted for common Pennsylvania practice in field operations, a large saving in labor was effected in most operations. The total cost was also reduced in many major operations but increased in some minor ones because of low load factor and sometimes because of high machinery cost, both of which were results of small crop acreage.

Electric service for light, heat, and power, T. E. Hienton and M. Rapp (*Indiana Sta. Circ. 157 (1928), pp. 24+4, figs. 37*).—Practical information on the use of electricity for farm and household uses is presented.

Electric motor drives elevator and grinder, O. E. Robey (*Michigan Sta. Quart. Bul., 11 (1928), No. 1, pp. 32, 33, fig. 1*).—Data on the use of an electric motor for the operation of an elevator and grinder are briefly presented, together with a diagrammatic illustration of the bins and machinery.

Research in farm machinery, 1927, R. W. TRULLINGER (*Agr. Engin., 9 (1928), No. 8, pp. 254–256, fig. 1*).—This contribution from the U. S. D. A. Office of Experiment Stations has been noted editorially (E. S. R., 59, p. 403).

Effect of drawbar pull upon the effective weight on front and rear wheels of farm tractors, E. G. MCKIBBEN (*Agr. Engin., 9 (1928), No. 8, pp. 243–245, figs. 7*).—The results of laboratory experiments and an analytical study conducted at the California Experiment Station are briefly presented and summarized in a highly technical manner. No conclusions are drawn.

Substitutes for breakpins—drawbar springs, E. G. MCKIBBEN (*Agr. Engin., 9 (1928), No. 6, pp. 167–170, figs. 6*).—Studies conducted at the California Experiment Station are reported which showed that a properly selected drawbar spring can give satisfactory and constant protection at low and medium tractor speeds if the implement will stand a drawbar pull of from 1.5 to 2 times the maximum tractive ability of the tractor. At higher tractor speeds it is probably not practical to replace the breakpin by use of a drawbar spring. Even the best of drawbar springs can afford little protection for a light implement which is pulled by a heavy tractor, for which it is not designed.

If the hitch is comparatively rigid an enormous drawbar pull may result from the sudden stopping of an implement by a relatively solid obstruction. For a given tractor and spring, the maximum increase in the drawbar pull and the corresponding deformation of the spring due to the sudden stopping of the tractor will vary as the speed of the tractor. For a given speed of tractor the maximum increase in the drawbar pull due to the sudden stopping of the tractor will vary as the square root of the load–deformation ratio of the spring, and the corresponding deformation of the spring will vary inversely as the square root of the load–deformation ratio of the spring.

For a given allowable increase in drawbar pull due to a sudden stopping of the tractor the load–deformation ratio of the required spring will vary inversely as the square of the speed, and the corresponding deformation of the spring will vary as the square of the speed. For a given allowable deformation of spring the load–deformation ratio of the required spring and the corresponding maximum increase in the drawbar pull due to the sudden stopping of the tractor will vary as the square of the speed of the tractor.

For a given spring and speed of tractor the maximum increase in the drawbar pull due to the sudden stopping of the tractor and the corresponding deformation of the spring will vary as the square root of the weight of the tractor. For a given spring and a given allowable deformation or increase in drawbar pull due to the sudden stopping of the tractor, the allowable speed will vary inversely as the square root of the weight of the tractor.

For a given speed and a given allowable increase in the drawbar pull due to the sudden stopping of the tractor, the load–deformation ratio of the required spring will vary inversely as the weight of the tractor, and the corresponding deformation of the spring will vary as the weight of the tractor. For a given speed and a given allowable deformation, the load–deformation ratio of the weakest allowable spring and the corresponding maximum increase in drawbar pull will vary as the weight of the tractor.

For a given allowable deformation and given allowable increase in pull due to the sudden stopping of a tractor the greatest allowable speed varies inversely as the square root of the weight of the tractor.

Substitutes for breakpins—spring overload release hitches, E. G. MCKIBBEN (*Agr. Engin., 9 (1928), No. 7, pp. 215–217, figs. 7*).—Studies conducted at the Califonia Experiment Station are reported from which the conclusion is drawn that a properly designed spring overload release hitch may combine most of the advantages of both the breakpin and the simple shock-absorbing drawbar spring, without the more serious disadvantages of either. This was borne out by an experimental study of three hitches obtained from three representative implement manufacturers.

Tractor plowing in stony ground, H. B. JOSEPHSON (*Agr. Engin., 9 (1928), No. 8, pp. 235, 236, figs. 3*).—Studies conducted at the Pennsylvania Experiment Station are briefly reported, indicating that under existing conditions in the State, tractor plowing is often difficult and in some cases not profitable due to rocks.

The cost of plowing with a two-plow tractor outfit ranged from $2.33 per acre on fields containing only a few rocks to $3.47 per acre on moderately stony fields and $4.07 per acre on very stony fields. The cost of plowing with horses was $3.91 per acre on moderately stony fields and varied but little under different conditions. The spring release hitch was found to result in considerable saving in time and energy under these conditions, and is so far the only remedy devised to meet the conditions in stony ground. Since the cost of plowing in stony ground was found to be distributed to the tractor 57 per cent, labor 25 per cent, and plow 18 per cent, the improvement of the plow is considered to offer possibilities. In this connection the requirements of a plow for stony ground were determined and are enumerated.

Combine harvesting in North Dakota, R. C. MILLER and A. H. BENTON (*North Dakota Sta. Bul. 220 (1928), pp. 26, figs. 11*).—This is a progress report of studies conducted cooperatively by the departments of agricultural engineering and agricultural economics of the station. It contains data from a survey of the use of the combine in which a large amount of information was obtained.

Moisture tests of grain harvested by the combine showed that the moisture increased before sundown. The average rate of combine travel was found to be about 2.5 miles per hour. It required about one drawbar horse power of tractor power per foot width of combine header. The test results indicated that any good separator or combine when properly adjusted will thresh all the grain from dry wheat heads. The results did not show any appreciable shattering in fields harvested with the combine. Winter rye was found to shatter more readily than wheat. Uneven ripening of the grain tended to lengthen the time between binder harvesting and combine harvesting.

Weeds which were ripe and dry caused little trouble in the operation of a combine, unless they were present in such quantity as to overload the separator. When the grain contained green weeds the power requirements of the combine were increased. Such weeds tended to clog the elevators and screens and thus interfered with the threshing and separating operations. A more serious drawback was the moisture added to the otherwise dry grain, either by green weed seeds or particles of green weeds, or by juices mashed from green weeds as they passed through the combine. Russian thistle and pigeon grass caused the most difficulty observed.

Data are also presented on the storage of combine grain, the conditioning of wet grain, the marketing of combine grain, expenses of combine operation, and combine attachments.

Soybean harvesting methods in Virginia, D. C. HEITSHU (*Agr. Engin., 9 (1928), No. 7, pp. 209–214, figs. 9*).—Studies conducted at the Virginia Experiment station are reported indicating that the present soy bean harvesting methods are very wasteful of the seed and that special soy bean harvesters are needed under certain conditions.

The combine was found to be a very successful soy bean harvester, although when equipped with rigid cutter bar and one-man control it is not suitable for average Virginia conditions. The power take-off type of drive for combines is not recommended for Virginia conditions. A cylinder speed of from 2,300 to 2,500 ft. per minute is recommended for the Virginia soy bean, and an increase in the separator speed of from 8 to 10 per cent is considered desirable.

It is concluded that improvements to better the operation and lengthen the serviceable life of the combine are needed on all machines.

Unit system for farm buildings, G. S. Henderson (*Agr. Research Inst., Pusa, Bul. 174* (*1928*), *pp. 3, pls. 3, figs. 3*).—Unit system farm buildings as developed in India for experiment stations and farms are described and diagrammatically illustrated. The use of rolled steel beam columns and of steel members has been found successful and practical.

General specifications for one unit of a portable shed are presented.

Air-cooled apple storages, C. E. Baker (*Indiana Sta. Circ. 154* (*1928*), *pp. 24, figs. 20*).—The results of studies on the air cooling of apple storages are summarized and discussed in a practical manner. Air-cooled storages may take the form of a cellar or they may be constructed entirely above the ground. In either case they should be well insulated to keep the fruit cool during early fall and to protect against freezing during severe winter weather.

Cooling is accomplished by moving large quantities of air through the storage, taking the cool air in at the lowest part of the building and removing the warm air from the upper part. The air intake openings must be large and numerous, and the outlet flues should also be of large size. A slatted false floor generally is used to permit the circulation of air beneath the fruit. With a dirt floor, sufficient relative humidity is usually maintained to prevent the fruit from shriveling. With a concrete floor it frequently becomes necessary to add moisture to maintain a satisfactory humidity.

Medium-sized fruit has been found to stand up better in storage than large, overgrown fruit, and ventilated bushel crates make the most desirable storage containers.

Eight air-cooled storages of different types and from different sections of Indiana are illustrated and described.

RURAL ECONOMICS AND SOCIOLOGY

Report of the Royal Commission on Agriculture in India, Linlithgow et al. (*London: Roy. Comm. Agr. India. 1928, pp.* [*5*]+*100*+*XVIII*+*755, pls. 21*).—Following the abridged report (p. 100), this volume contains the full report (pp. 755) presented to Parliament in June, 1928, by the Royal Commission appointed in 1926 to investigate, report on, and make recommendations as to the methods now taken to promote agricultural research, experiment, demonstration, and education; for the compilation of agricultural statistics; and for the introduction of new or improved crops and agricultural practices; the existing methods of transporting and marketing agricultural products and financing agricultural operations; and the main factors affecting the rural prosperity and welfare of the agricultural population.

The data gathered are considered under the following headings: Introduction, historical retrospect, the organization of agricultural research, agricultural improvement, the subdivision and fragmentation of holdings, demonstration and propaganda, animal husbandry, forests, diseases of livestock and their control, irrigation, communications and marketing, the finance of agriculture, cooperation, the village, education, rural industries and labor, horticulture and plantations, statistics, the agricultural services, miscellaneous, and conclusion.

Appendixes include the questionnaire used, list of witnesses, and a glossary.

Type-of-farming areas in Massachusetts, R. L. Mighell and M. Brown (*Massachusetts Sta. Bul. 244 (1928), pp. 253–268, figs. 15*).—Included are maps, based on the 1925 U. S. Census of Agriculture, showing for Massachusetts the distribution of farms; land elevation; distribution of population; percentage of land in farms; percentage of farm land plowable and in pasture; value of land and buildings; the 13 type-of-farming areas; number of dairy cows, poultry, and bearing apple trees; acres of out-of-door vegetables and cranberry bogs; and amount of silage corn, hay, and feed purchased; and the distribution of fertilizer, tobacco, and onions in the Connecticut Valley. A table shows the number and size of farms and the acreage and number of livestock per farm and per 100 acres of plowable land in the 13 type-of-farming areas.

[Factors affecting farm income], E. B. Hill (*Michigan Sta. Quart. Bul., 11 (1928), No. 1, pp. 27–29*).—The effect of size of business on returns is discussed, using the data obtained in a farm organization study made in the spring of 1928 in Eaton County, an area in a general farming region in which the production of market milk and cash crops predominates. The survey included 13 farms of from 37 to 60 acres, 32 of 61 to 100, 35 of 101 to 140, 16 of 141 to 180, 7 of 181 to 220, and 10 farms of over 220 acres.

The average operator's labor income (farm income, less 5 per cent on investment) for the different groups was $491, $538, $585, $742, $728, and $856, respectively, averaging $615. The average return on investment, after deducting $720 for operator's labor, for the different groups was 1.3, 2.7, 3.8, 5.1, 4.5, and 5.5 per cent, respectively, averaging 4 per cent.

Dairy and other livestock production costs in Medina County, Ohio, F. L. Morison (*Ohio Sta. Bul. 424 (1928), pp. 53, figs. 4*).—This bulletin presents an analysis of livestock production costs, obtained by the complete cost-route method, of 23 farms in Medina County during the years 1920 to 1924, inclusive. The farms averaged 135 acres, of which 80 acres were in crops and 37.4 acres in permanent pasture. Of the average annual gross income of the 23 farms, 65.7 per cent was from livestock, 45.3 being from dairy products and 10.5 from poultry and eggs; 26 per cent from crop sales; and 8.3 per cent from other receipts.

Tables are given and discussed showing the averages by years for all farms and by farms for the period of the cost by items of keeping a cow, a bull, 100 chickens, and a sheep, and of producing 100 lbs. of 3.5 per cent milk, a dozen eggs, a pound of wool, and 100 lbs. of pork. Other tables show the relation of feed consumption, season of freshening, and annual production per cow, uniformity of milk production, and other factors affecting costs and profits in producing milk; the season of egg production and production per hen to costs and profits of producing eggs; and other factors affecting costs and profits from the different enterprises.

The average net cost of keeping a cow was found to be $192.37 per year, feed and pasture constituting 51.8 per cent and labor 20.8 per cent. The cost of producing milk ranged from $2.13 to $3.89 per 100 lbs., averaging $2.60. The average selling price was $2.67 per 100 lbs. The cost of herds averaging less than 6,000 lbs. of milk per cow per year was $3.08 per 100 lbs., as compared with $2.29 for herds averaging 9,000 lbs. Owners of the low producing herds received less than 11 cts. per hour for labor, as compared with 51 cts. per hour for owners of high producing herds. Herds freshening principally in the fall averaged 1,332 lbs. of milk per year per cow more than herds freshening mostly in the spring, and the production was at a lower cost per 100 lbs.

The net annual returns from poultry varied from a loss of $70 to a profit of $115 per 100 fowls. Feed and labor formed 57.8 and 24.2 per cent, respectively, of the average cost of the poultry enterprise. The cost of producing eggs varied from 19.7 to 53.2 cts. per dozen, averaging 34.6 cts., and the average selling price was 38.6 cts. per dozen. Farmers having 16 per cent or more of their egg sales from October to January, inclusive, received 70 cts. per hour for their labor, as compared with 25 cts. per hour for farmers who sold less than 8 per cent of their eggs in the same months. In flocks averaging 115 eggs per hen per year, the costs were only 50 per cent higher than in those averaging 48 eggs, but the returns over all costs were 7 times as great.

Feed and labor constituted 64.2 and 12.4 per cent, respectively, of the cost of keeping sheep. Size of flock, lambs raised per 100 ewes, and weight of wool per fleece were the principal factors affecting profits from sheep.

The cost of producing hogs varied from $10.16 to $17.72 per 100 lbs., averaging $12.69. Feed was 70.5 per cent and labor 15.9 per cent of the average total cost.

Costs of producing sugar beets.—VIII, Montana, E. B. Brossard et al. (*Washington: U. S. Tariff Comm., 1928, pt. 8, rev. ed., pp. VI+64, figs. 6*).—This is a revised edition of the bulletin previously noted (E. S. R., 57, p. 84.)

Interrelationships of supply and price, G. F. Warren and F. A. Pearson (*New York Cornell Sta. Bul. 466 (1928), pp. 144, figs. 89*).—"This bulletin is an attempt to express mathematically some of the relationships of supply to price, relationships of price to supply, relationships of farm and retail prices, and the effect of supply on these relationships."

Using data on production and prices reported in publications of the U. S. Department of Agriculture, other Federal departments, State agricultural experiment stations and departments of agriculture, and foreign governments, in trade journals, and by individual investigators, supply-price curves were prepared and 221 equations derived showing the relation of production or supply of different agricultural products and other commodities in different areas, for different periods, etc., to prices for different periods, in different localities and markets, etc., and a table was prepared showing the relationships of the prices to normal when production is 10, 20, 30, and 40 per cent below normal, and 10, 20, 30, 40, 50, and 60 per cent above normal.

The findings for each of the agricultural products and for industrial products are analyzed and discussed under one to six of the following headings: Effect of supply on prices; effect of supply on total value; relation between farm, wholesale, and retail prices; effect of size of crop or supply on farm, wholesale, and retail prices; effect of prices on acreage planted, production, and future supply; relation of prices to imports and consumption; effect of location of supply on prices; cost of distribution; and effect of inflation and deflation on price relationships.

An appendix (pp. 115–142) contains the sources of data, a description of the methods of calculation, a brief summary of other investigations of the effects of production on prices, a brief analysis of the supply-price curves used by other writers, and the equations derived in the present study.

The following are some of the conclusions arrived at from the study: The price received by the producer is the only price affecting production, that paid by the consumer the only price affecting his consumption. Consumption of the part of the supply used on the farm is affected by farm prices, which fluctuate violently; that of the part retailed by retail prices, which fluctuate little; that of the part which is sold in cans by prices of canned goods, which fluctuate still less; and that of the part consumed in hotels by prices on the bill of fare, which are practically indifferent to supply. Consumers' prices are governed by supply and demand; those paid to farmers are consumers' prices less the cost of distribution. The agricultural depression is primarily due to high handling charges which have resulted from deflation. For agricultural products high supply means low prices, while for most industrial products a year of high supply is a year of high prices. Less total dollars are received by farmers for a large crop than for a small one, although consumers pay more dollars for a large crop than for a small crop. With large crops the farm price is reduced more per bushel than is the retail price, but the cost per bushel of getting a cheap crop to the consumer is greater than for a high-priced crop. Farm prices are frequently affected as much by the location of the supply as by the total supply. The increase in eating in restaurants, stabilization of retail prices, use of package goods, commercialization of agriculture, specialization of farming, urban growth, especially of large cities, and farm efficiency have tended to cause farm prices to fluctuate violently, and such fluctuation was becoming an important national problem even before the war. Deflation after the war made freight and other distributing charges high relative to retail prices and caused violent fluctuations in farm prices. Farmers respond to prices as vigorously as does industry, but they are dealing with biological facts. Retail prices of food in the United States do not indicate an oversupply or an underdemand.

Eleventh annual report of the Federal Farm Loan Board for the calendar year 1927, A. W. Mellon et al. (*U. S. House Represent., 70. Cong., 1. Sess., Doc. 324 (1928). pp. III+122*).—This report to Congress covers the operations of the Federal land banks, joint stock land banks, Federal intermediate credit banks, and national farm loan associations for the year ended December 31, 1927. Numerous tables and statistical reports are included.

The collection of general-property taxes on farm property in the United States, with emphasis on New York, M. S. Kendrick (*New York Cornell Sta. Bul. 469 (1927), pp. 51, figs. 5*).—The results are reported of a study to determine how the costs of collecting taxes vary among States using different administrative units of collection, different collecting officials, and different methods of payment. The study is based on reports of tax commissioners, replies to letters to State tax boards, and questionnaires mailed to tax-collecting officials.

The costs of collecting in New York, Connecticut, Pennsylvania, Massachusetts, and Michigan, States where the township or municipal district is the unit of collection and collections are usually made on a fee basis, were found to be the following percentages of the total collections: New York from 0.9 to 2.3 per cent, averaging 1.35 per cent, for the State for State, county, and town taxes, and from 0 to 2.8 per cent, averaging 1.12 per cent, for the State for school taxes; Connecticut from 0.21 to 1.1 per cent in different counties, being 0.33 per cent for the State; and Pennsylvania from 0.2 to 6.9 per cent in 29 different counties, being 2.99 per cent for the group. In Massachusetts the cost was estimated at 2 per cent, the collectors being paid on a salary basis. In Michigan the fees ranged from 1 to 4 per cent.

The cost of maintaining county treasurers' offices in 18 States where the treasurer collects taxes varied from 0.3 to 3.5 per cent, averaging 0.7 per cent of the taxes collected. Data from three States with county collectors on a salary basis showed a cost of from 0.4 to 0.9 per cent, averaging 0.5 per cent, and that from three States with county collectors on a fee basis showed a cost of from 1.5 to 2.7 per cent, averaging 1.94 per cent.

Comparisons are made of the cost of county treasurer collections in other States with that of town and school district collections in New York, and the probable gains if the county treasurer system were introduced in New York are discussed.

Suggestion is made that a county tax collection law should provide that the county treasurer collect all general property taxes and assessments levied in the county, that the county treasurer be required to give notice of taxes by mail, that taxes when collected shall be deposited on interest in banks fulfilling certain requirements, that all funds—county, school district, and town—be paid out by warrants on the county treasurer, that the county treasurer be put on a salary basis, and that he be provided with adequate equipment.

Tax delinquency in northern Wisconsin, B. H. Hibbard, J. Swenehart, W. A. Hartman, and B. W. Allin (*Wisconsin Sta. Bul. 399* (*1928*), *pp. 29, figs. 6*).—A study was made of the tax delinquencies by years from 1921 to 1927, inclusive, in 17 counties in northern Wisconsin. Of the 11,358,030 acres in the area, 11.9 per cent was in saw timber; 22.9 per cent in farm land, 6 per cent being in crops and 16.9 per cent in pasture, timber, cut-over, idle, etc ; and 65 2 per cent mainly cut-over land.

The taxes per acre and the relative assessments on different classes of land were found to have increased and changed materially since 1890, having been in 1890, 1918, 1920, and 1925, 11, 97, 208, and 164 cts. per acre, respectively, on virgin hardwood and hemlock timber land; 17, 62, 121, and 121 cts. per acre on farm land; 12, 26, 49, and 43 cts. per acre on second growth land; and 12, 22, 36, and 34 cts. per acre on barren cut-over land.

The area represented by tax certificates bid in by the counties or sold to private parties increased from 1,082,232 acres in 1921 to 2,593,163 acres, or nearly 25 per cent of the land in the counties, in 1927. The percentage of land sold to counties increased from 40.2 in 1921 to 81.6 in 1927. The area represented by outstanding certificates held by the counties increased from 45,371 acres in 1921 to 1,921,105 acres in 1927, and the total area in 1927 with one or more outstanding certificates for the last seven years was 3,041,133 acres.

While the fundamental cause of the increase in delinquency was an appreciable increase in the tax per acre in the face of decreased land values, delinquency itself caused further delinquency, as shown by a study in one of the towns where it was found that the tax per acre on lands not delinquent rose from 54 cts. in 1920 to 71 cts. in 1923 and 73 cts. in 1926, while that on lands delinquent rose from 32 cts. in 1920 to 50 cts. in 1923 and declined to 38 cts. in 1926.

Brief descriptions are given of the efforts to solve the problem, which included fact-finding studies and extension work by the agricultural college, the forest crop law of 1927, the State school tax equalization law, the legislation of 1927 permitting counties to develop and administer forests, and that permitting the Federal Government to purchase lands for national forests.

Sources of carload receipts of food in Providence, Rhode Island, 1921–1925, R. B. Corbett (*Rhode Island Sta. Bul. 215* (*1928*), *pp. 106, figs. 45*).—Tables, maps, and charts are given and discussed showing by years the carload receipts by rail and water of different fresh fruits and vegetables, hay, grain and feed, meat and livestock, flour, sugar, eggs, canned goods, butter, poultry, milk, cereals, and other foods; the trends in the carload receipts of different products; origin of shipments by States; and freight charges on different products from different States to Providence.

Marketing American cotton on the Continent of Europe, A. B Cox (*U. S. Dept. Agr., Tech. Bul. 78* (*1928*), *pp. 96, figs. 11*).—The marketing facilities and processes for cotton at Bremen and its hinterland, and in the Netherlands, France, Belgium, Italy, and Spain are described and discussed.

Marketing high protein wheat, E. J. BELL, JR. (*Montana Sta. Bul. 213 (1928), pp. 47, figs. 31*).—Charts are included showing the average monthly premium of No. 1 winter wheat with 13 per cent protein content at Minneapolis for the 1924 to 1927 crops, inclusive, and the reason for the fluctuations are discussed. The problems of the farmer in obtaining proper premium or premiums for his crop by selling to local elevators, by storage on the farm, by holding storage tickets on country elevators, and by direct shipments to terminals, and those of elevator managers in endeavoring to reflect the full premium value to growers are described.

The McIntosh apple on the New York market. L. P. JEFFERSON (*Massachusetts Sta. Bul. 243 (1928), pp. 189–200*).—This is a brief discussion of the volumes of McIntosh apples from different sections sold at auction in New York City from 1924–25 to 1927–28, inclusive, and the prices received.

Marketing California grapes, E. W. STILLWELL and W. F. COX (*U. S. Dept. Agr. Circ. 44 (1928), pp. 153*).—This bulletin gives a brief survey of the grape industry and a review of the 1927 season Thirty-three tables are included giving information as to the production by States; acreages of vines bearing and nonbearing and of plantings, 1926 and 1927, in California; production of grapes in California; monthly shipments by States; daily, weekly, and monthly carload shipments by varieties, points at which loaded, primary destinations, daily unloads in the leading markets, grades, prices received, etc., of California grapes in 1927, together with comparisons with other years and other States; and other information regarding different phases of production and marketing of California grapes of different varieties and classes.

The data were collected in 1927 in cooperation with the California Vineyardists Association.

The market for milk in Richmond, Virginia, J. J. VERNON and R. S. KIFER (*Virginia Sta. Bul. 263 (1928), pp. 15, figs. 5*).—This bulletin reports the results of a study made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of the production of milk in the territory supplying Richmond and the consumption in that city.

The increases from 1922 to 1926 in the different items investigated were: Population, 180,000 to 198,000 (155,000 in 1915 to 200,000 in 1927); number of milk producers, 179 to 236 (135 in 1918); milk purchased by distributors, 3,480,000 to 5,061,000 gal.; milk sold by distributors, 3,014,000 to 3,527,000 gal.; surplus milk, 466,000 to 1,534,000 gal.; and per capita consumption per day of whole milk, 0.367 to 0.404 pint. The per capita consumption of whole milk in Richmond was found to be but 0.404 pint per day, as compared with 0.527 to 0.805 pint in other cities listed.

Some conclusions are drawn as to the possible results of a continuation of the present production and consumption tendencies.

Crops and Markets, [August, 1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 8, pp. 273–320, figs. 3*).—Tables, graphs, notes, reports, and summaries are presented covering cold storage holdings; acreage, yield, and condition of crops; production, stock, prices, etc., of crops, fruits, vegetables, feedstuffs, and livestock, dairy, and poultry products; price movements of agricultural products; and the price situation.

Special articles are included on farmers' intentions to sow winter wheat and rye; the lamb crop, 1928; and the sheep and wool outlook, August, 1928.

Grain Growers' coöperation in western Canada, H. S. PATTON (*Cambridge: Harvard Univ. Press, 1928, pp. XIX+471*).—The origins, growth, experiences, and interrelations of the cooperative grain-marketing institutions of western Canada, the functions demanded of, and assumed by, the Canadian governmental agencies in connection with grain marketing, and the relations between private middleman agencies, public institutions, and farmers' cooperative organizations are described and discussed under the following headings: The struggle for free marketing, 1900–1910 (pp. 1–76); the farmers' cooperative elevator companies, 1911–1923 (pp. 77–186); the movement for collective marketing, 1919–1927 (pp. 187–278); and results and tendencies in the grain growers' cooperative movement (pp. 279–410).

Appendixes contain statistics, texts of acts, contracts and agreements, and a list of sources and references.

The establishment and maintenance of peasant farms, S. Kawada (*Kyoto Univ. Econ. Rev., 3 (1928), No. 1, pp. 75–99*).—The plan for the establishment and maintenance of peasant farms drafted by the Japanese Government in November, 1927, is analyzed, and comparisons are made with previous plans and the plans used by Great Britain and Germany.

[Papers and proceedings of the American Sociological Society, 1927] (*Amer. Sociol. Soc. Pubs., 22 (1928), pp. VIII+353, fig. 1*).—This volume entitled The Relation of the Individual to the Group includes the proceedings of and papers read at the twenty-second annual meeting of the society, held at Washington, D. C., December 27–30, 1927. The papers and abstracts of papers bearing directly on rural sociology were as follows: The Relation of the Farmer to Rural and Urban Groups, by D. Sanderson (pp. 100–110); Changing Relations between Town and Country, by J. M. Gillette (pp. 111–119); The Application of the Statistical Method to the Study of the Wealth and Welfare of Farm Families, by J. A. Dickey (pp. 207–210); Special-Interest Groups in Rural Society, by J. H. Kolb (pp. 211–213); Application of the Case Method to the Study of the Wealth and Welfare of Farm Families, by G. H. Von Tungeln (pp. 214–218); Principles of Expenditure of Farm Incomes, by C. C. Zimmerman (pp. 219–221); A New Force in Research, by C. J. Galpin (pp. 230, 231); Scope, Methodology, and Personnel in Rural Social Research, by J. H. Kolb (pp. 232–235); The Next Steps in Rural Sociological Research, by E. Mumford (pp. 236–240); The Next Steps in Research, by W. Gee (pp. 241–243); The Status of Rural Sociology in Colleges and Universities, by C. R. Hoffer (pp. 244–249); A Partial Analysis of Textbooks in Rural Sociology, by C. C. Zimmerman (pp. 250–255), Report of the Committee on Extension Work in Rural Sociology, by W. H. Stacy (pp. 260–262); Extension Needs in the Field of Rural Social Organization, by H. C. Ramsower (pp. 263–267); The Impact of Urbanism on Rural Areas and the New Rural Community, by E. C. Lindeman (pp. 288, 289); A Case Study in Rural Urban Conflict, by B. Y. Landis (p. 289); Use of Community Score Cards in a Trade Center and Surrounding Neighborhoods, by N. T. Frame (pp. 289, 290); and The Community Aspects of Rural Libraries, by W. C. Nason (p. 294). Some of these papers have been referred to editorially (E. S. R., 58, p. 301).

Social organizations and agencies in North Dakota, E. A. Willson (*North Dakota Sta. Bul. 221 (1928), pp. 79, figs. 71*).—Maps and tables are given and discussed showing by counties the total and farm population; the nationality of farmers; location of State highways; number and location of schools and educational institutions of different kinds and enrollments therein; number and location of agricultural research and extension service institutions and organizations; libraries; fairs; chautauquas and lyceums; newspapers; health agencies; churches by denominations and other religious agencies; fraternal societies; war veteran organizations; class, occupational, and community organizations by organizations; parks and recreation centers; and commercialized recreation and entertainment agencies.

This study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

FOODS—HUMAN NUTRITION

Food products; Their source, chemistry, and use, E. H. S. and H. S. Bailey (*Philadelphia: P. Blackiston's Son & Co., 1928, 3. ed., rev., pp. XVIII+563, figs. 104*).—A revision of the volume previously noted (E. S. R., 46, p. 859).

Hows and whys of cooking, E. G. Halliday and I. T. Noble (*Chicago: Univ. Chicago Press, 1928, pp. XII+179, pl. 1, figs. 40*).—This volume, which is based upon the authors' experience of several years in experimental cookery in the department of home economics at the University of Chicago, discusses the "hows and whys" of successes and failures in some of the ordinary cooking processes as conducted in the home. These include the cooking of vegetables to preserve color, flavor, and nutrients, and the making of muffins, cakes, baking-powder biscuits, pies, candy, and ice cream. Attention is paid to utensils, proportion of ingredients, manipulation, and temperature and time of cooking. emphasis being placed on the necessity for proper control of all of these factors. An unusual feature is the chapter on candy, in which microphotographs are used to illustrate the difference in crystal structure of good and poor fondant. Photographs are also included of various utensils and of good and poor samples of the types of foods studied.

Lamb as you like it, L. M. Alexander and F. W. Yeatman (*U. S. Dept. Agr. Leaflet 28 (1928), pp. 8, figs. 7*).—This illustrated leaflet, similar to the one on beef (E. S. R., 58, p. 491), contains directions for roasting leg of lamb with the use of meat thermometers, and for the preparation and serving of broiled lamb chops, roast saddle, roast stuffed shoulder, roast stuffed breast, lamb stew, and curry of lamb. A mint or water-cress stuffing is suggested for the shoulder and one of forcemeat for the breast.

Jelly-strength measurements of fruit jellies by the Bloom gelometer, C. R. Fellers and F. P. Griffiths (*Indus. and Engin. Chem., 20 (1928), No. 8, pp. 857–859, figs. 3*).—Slight modifications of the Bloom gelometer to adapt it to the testing of fruit jellies are described, and data are reported on the accuracy of the modified apparatus for jelly strength measurements and on determinations of the jelly strength of fruit jellies at different temperatures and after storage under different conditions.

In jelly strength determinations on a series of 22 samples, the average percentage deviation was approximately 5 per cent. The jelly strength decreased rather uniformly at a rate of about 1 gm. per degree with increasing temperatures between 10 and 30° C. It was found unnecessary in ordinary work on fruit or pectin jellies to use a chill bath as is done with gelatin, satisfactory results being obtained at temperatures of from 20 to 23°. Contrary to results reported by Tarr (E. S. R., 55, p. 87), it was found that the surface of uncovered jelly toughened very noticeably on standing. For this reason it is considered necessary, if jelly strength determinations are to be made, to cover the surface of the jelly with melted paraffin or a hermetic seal soon after making.

The extraction of apple juices in the manufacture of jelly, C. R. Fellers (*Massachusetts Sta. Tech. Bul. 15 (1928), pp. 217–251, figs. 6*).—For the purpose of standardizing the extraction of apple juice for jelly making, a series of extractions under varying conditions was made during two seasons of several varieties of apples. Analyses were made of the apples and the various extracts, the determinations including soluble solids, pectin, and malic acid. Jellies were made from the juices under standard conditions and compared as to jelly yield, acidity, sugar content, and jelly strength.

The extracts were prepared by three successive extractions of given weights of apples at 88, 100, 109° C. (190, 212, and 228° F.), respectively, for 15, 30, and 60 minutes, and also for 15 minutes followed by a standing period of 10 minutes. Comparisons were made of sliced, chopped, and pulped fruit; of variations in the ratio of apple to water of 3 : 2 and 3 : 4 by weight; and of varying concentrations of acid added to the apple. Pectin was determined by precipitation with 10 per cent hydrochloric acid after the addition of a small amount of 10 per cent sodium hydroxide, the resulting precipitate being heated in a water bath until flocculated and then centrifuged. The volume of the precipitate was considered to be proportional to the amount of pectic acid. Jelly strength determinations were made by the Bloom gelometer, with modifications described above by Fellers and Griffiths.

The optimum yields of juice of satisfactory quality were obtained with two short (15 minutes) successive extractions. A single extraction, if short, did not liberate the pectin and, if long, injured its jellifying power. The optimum temperature was found to be 100° C. Only slightly higher yields were obtained with the use of a retort or pressure cooker and their use is not recommended. The optimum ratio of fruit to water was 3:2 in the case of sliced apples or 3:3 with chopped or grated apples. The yield of jelly per pound of fruit was greatest at a ratio of 3:4 and lowest at 3:2. Chopped apples gave a slightly more concentrated juice and a greater jelly yield than sliced apples, but the juice was filtered with difficulty and the finished jellies were cloudy. Tartaric acid in concentrations of 0.2 to 0.4 per cent increased the yield of solids and pectin slightly, as well as that of total jelly, and improved the color, flavor, and consistency of the jellies.

The juices obtained by two 15-minute extraction periods with equal parts of fruit and water gave the best results in jelly making. Determinations of the sugar content of all the jellies gave an average value of 67.5 per cent. Jellies containing less than 65 per cent of sugar were tough and those containing over 70 per cent soft and sirupy. It was found to be much more satisfactory to proportion the sugar to the original weight of fruit than to the extracted juice. The experimental data obtained are given in an appendix which includes a table for estimating the yield of apple jelly that may be obtained from a unit weight of apples if the same manufacturing process is followed.

Preservation of peaches for use in the manufacture of ice cream, C. W. Culpepper, J. S. Caldwell, and R. C. Wright (*U. S. Dept. Agr., Tech. Bul. 84* (1928), pp. 14).—Several of the more widely grown eastern commercial varieties of peaches have been compared for their suitability for making a preserved crushed fruit or pulp for flavoring ice cream, attention also being paid to the most favorable stage of maturity for the best flavor. Satisfactory varieties have been used in comparative tests of the suitability of canning and of freezing in the preservation of the pulp and of the most favorable proportions of fruit and cream.

Most of the varieties tested proved satisfactory provided fully ripe fruit was used, although two or three were not quite as acceptable as the others. The yellow-fleshed varieties gave a richer appearance to the cream. Freezing gave products of rather better flavor than canning, but the slight differences were obviated to a great extent by the use of larger quantities of the canned than the frozen fruit. The choice of a method of preservation is considered to depend upon a number of factors, particularly the proximity of adequate facilities for refrigeration and large consuming centers.

The addition of sugar to the extent of 40 per cent of the fruit brought out the flavor most satisfactorily, but it proved immaterial whether the sugar was added to the peaches before preservation or in the making of the ice cream. The addition of the sugar before freezing is, however, considered a wise precaution to prevent fermentation. To produce the best flavor the peaches should constitute from 15 to 20 per cent of the mix. Vanilla extract should not be used, as instead of intensifying it tends to mask the characteristic peach flavor.

Detailed directions are given for the preservation of the fruits by both of the recommended methods.

Biochemistry of animals, C. T. Gimingham and J. Pryde (*Ann. Rpts. Prog. Chem. [Chem. Soc., London], 24 (1927), pp. 242–272*).—This portion of the volume noted on page 10 consists of a review of recent literature on vitamins, specific carbohydrates from bacteria, organic phosphates and lactacidogen-ammonia formation in muscle, lactic acid-forming enzymes from muscle, insulin and its rôle in carbohydrate metabolism, and hemoglobin, hemochromogen, and cytochrome.

A study of the effect of yeast upon metabolism, E. U. Still and E. M. Koch (*Amer. Jour. Physiol., 85 (1928), No. 1, pp. 33–44*).—Long continued metabolism experiments on human subjects on controlled diets, the first a low purine–low protein and the second a high protein–meat-containing diet, to determine the effect of added yeast to such diets are reported with the following general results:

On the low purine–low protein diet the addition of yeast (three cakes daily) increased the elimination of uric acid if this had not already reached a low level, but had no effect on it if the level was already low. The blood uric acid was not increased. In five out of six individuals the total urinary phenols were less during and following the yeast ingestion, thus indicating a favorable change in the intestinal flora. The total excretion of nitrogen and phosphorus was greater during the yeast ingestion, the excess being largely in the feces.

In general evacuation was more regular on the yeast diet, and the feces were more bulky but of no higher moisture content.

Metabolism of undernourished children, IV, V (*Amer. Jour. Diseases Children, 35 (1928), Nos. 5, pp. 856–861; 6, pp. 968–973*).—This continues the investigation previously noted (E. S. R., 56, p. 395).

IV. *Calcium metabolism*, C. C. Wang, M. Kaucher, and M. Frank.—The authors have conducted calcium metabolism studies on 10 normal and 50 undernourished children from 4 to 13 years of age, all of whom lived in the hospital from 10 days to 23 weeks and received the weighed diets for at least 6 days, the collection of urine and feces being made on the last 3 days of the experiment. In reporting the results the same 5 groups by weight were used as in the previous study.

There was no marked difference in the intake or in the average excretion of calcium in all of the groups. The intake was between 0.06 and 0.08 gm. of CaO per kilogram per day in 57 per cent, more than 0.08 gm. in 34 per cent, and less than 0.06 in only 9 per cent of all the children. In 3 of the 5 groups the average excretion was 0.063 gm. of CaO per kilogram, and in the other 2 the averages were 0.069 and 0.058 gm. The maximum individual excretion was 0.105 and the minimum 0.041 gm., both of these extremes occurring in the vigorous normal group.

The calcium absorption and retention showed wide individual variations in all groups. The figures ranged from 0.009 to 0.033 gm. of CaO per kilogram for absorption and from 0.003 to 0.028 gm. for retention. In both, the figures were slightly higher for groups 3 and 4 than for the other groups. This is attributed to the fact that the diets in these groups had probably been too low in calcium before the children entered the hospital.

It is concluded that the capacity of undernourished children for the absorption and retention of calcium is normal, and that "the underweight child is not underweight because of any abnormalities in metabolism but because of an insufficient and unsatisfactory diet."

V. *Protein metabolism*, C. C. Wang, J. E. Hawks, and B. B. Hays.—The authors have determined in a series of 59 experiments the nitrogen metabolism of 10 normal and 39 underweight children, most of whom have served as subjects in the previous studies of the series. The nitrogen content of the diet was calculated in terms of the protein intake for the normal body weight for height and age of each subject, but owing to marked differences in appetite it was impossible to carry this out in all cases. Except in 3 instances the intake varied from 0.396 to 0.687 gm. of nitrogen (or 2.48 to 4.29 gm. of protein) per kilogram of body weight.

The average absorption of nitrogen was practically the same for the 5 groups, and varied from 90.1 to 91.9 per cent of the intake. The retention, however, was much higher, both in percentage of intake and per kilogram of body weight, in the undernourished children. The average retentions for the 5 groups, going from the vigorous normal to those 15 per cent or more underweight, were 9.3, 17.2, 20.3, 22.1, and 24.3 per cent, respectively. Calculated in terms of body weight the average retention increased from 0.041 gm. of nitrogen per kilogram of body weight for the vigorous normal child to 0.134 gm. for the group more than 15 per cent underweight.

This ability of the undernourished child to absorb and store nitrogen at a rate equal to or greater than the normal child is thought to indicate a greater protein requirement for undernourished than normal children and to suggest the advisability of computing the protein requirement of underweight children according to the standard rather than to the actual weight of the child

Factors in the decay of teeth, L. O. Kappes (*Amer. Jour. Diseases Children, 36 (1928), No. 2, pp. 268–276*).—In an attempt to determine the factors involved in the decay of teeth in children, two groups of 25 children from 5 to 13 years of age were selected for comparison, one group having perfect or nearly perfect teeth and the other showing dental caries involving half or more than half of the teeth. The mothers of each of these children were questioned concerning the diets of the children from birth, the care of the teeth and time of their eruption, the general health and past illnesses, and also concerning her own diet and health during pregnancy.

A comparison of all of the factors studied showed no significant differences which might be considered responsible for causing or preventing teeth decay with the exception of the consumption of fruits and vegetables by children over 1 year of age. Green vegetables, fruit, meat, and eggs predominated in the diets of 13 of the children with good teeth and of only 3 of those with poor teeth, while carbohydrates predominated in those of 14 of the children with poor teeth and of only 3 of those with good teeth. Six of the children with good teeth and 12 of those with poor teeth drank 3 or more glasses of milk a day. The fact that carbohydrates predominated in the diets of 9 of the 12 children in the second group is thought to suggest the possibility that milk when served in large quantities is more likely to crowd out vegetables and fruit than carbohydrates, and that it is not as effective as the fruits and vegetables in preventing dental decay.

Every child's dietary for mothers and children, P. S. Shackelford (*New York: Natl. Fed. Day Nurseries, 1927, pp. 1+46, figs. 3*).—This publication, prepared for the National Federation of Day Nurseries, contains practical directions with illustrative menus and recipes for the feeding of children from two to seven years of age.

The vitamins of commercially concentrated orange juice, S. G. Willimott (*Biochem. Jour., 22 (1928), No. 2, pp. 535–544, figs. 3*).—Concentrated orange juice manufactured in California from ripe navel oranges has been compared as a source of vitamins B and A with fresh orange juice from the same variety of oranges (E. S. R. 59, pp. 93, 94), with results indicating no loss of activity during the manufacturing process.

It is noted that the concentrate is the same brand as that reported by Goss (E. S. R., 53, p. 458) and Priston (E. S. R, 55, p. 194) as possessing antiscorbutic properties equal to the fresh juice.

Analyses of the concentrate reported from California, Berlin, and Vienna are also included.

Food values of New Zealand fish.—Part IX, Tinned toheroa and toheroa soup, J. Malcolm (*New Zeal. Inst. Trans. and Proc., 59 (1928), pt. 1, pp. 85–90, figs. 2*).—This paper consists chiefly of a report of studies of the vitamin A content of canned toheroa (*Amphidesma ventricosum*), a bivalved mollusk found on the northern coast of New Zealand, and of canned soup containing 9 and 10 per cent of the solids of the toheroa.

The technic followed differed from the customary in that after the period of depletion on the vitamin A-free ration, which was rather long probably on account of the vitamin A in the table scraps used in the stock diet, the feeding of the material to be tested was continued for only 10 days, after which the rats were kept on the basal diet until death. The object of this procedure was to obtain some idea of the amount of vitamin A in the food from the storage of it during the experimental period as well as by the cure of xerophthalmia and resumption of growth. From the limited amount of data presented the material appeared to be a rather rich source of vitamin A, somewhat better than oysters. It is estimated that from 1 to 2 gm. daily of the canned product or the equivalent of the canned soup supplies sufficient vitamin A for the needs of the rat, and that good results are possible on as small an amount as 0.5 gm. daily.

A critical examination of methods of evaluating vitamin A by means of the growth of rats, E. M. Hume and H. H. Smith (*Biochem. Jour., 22 (1928), No. 2, pp. 504–521, figs. 5*).—An attempt has been made to answer the question of the best method for the quantitative determination of vitamin A by a series of experiments in which spinach and butter were used in graded amounts as the source of vitamin A in feeding experiments on rats with and without a preliminary depletion period, with various means of supplying vitamin D, and with variations in the amount of vitamin B. From the results obtained and also data reported by other workers with varying technic, the conclusion has been drawn that it is immaterial as far as the growth response is concerned whether the animals are irradiated directly or are given an irradiated food material as the source of vitamin D, but that the latter method is more convenient and does away with possible eye injury that may be confused with xerophthalmia, due to a lack of vitamin A. A double dose of vitamin B produces growth at a slightly higher level but proportionately the same.

Contrary to the recommendations of most workers, the authors are of the opinion that the results obtainable with a preliminary depletion period are not as reliable as without. In their opinion the growth response following a depletion period is as follows: "(*a*) Very small or no dose. No recovery. (*b*) Small doses. Subnormal growth, graded quantitatively to the dose; later, premature slackening. (*c*) Larger doses. Normal growth for a time, followed by premature slackening. (*d*) Optimal dose. Normal growth to maturity. The peculiar character of the growth under (*b*) and (*c*) is regarded as a disproportionate response to a supply of vitamin after depletion, which cannot be maintained subsequently."

For this reason it is suggested that the depletion period be dispensed with or, if it is used to save time. that only those doses be used which are likely to give the responses (*a*) and (*b*).

The vitamin B content of malt extract, A. L. BACHARACH and E. ALLCHORNE (*Biochem. Jour., 22 (1928), No. 2, pp. 313–316*).—Following the technic of Bacharach and Hartwell (E. S. R., 58, p. 793), the authors have determined the vitamin B content of samples of flour before and after malting, of especially prepared malt extract, and of several samples of commercial malt extract. The results indicate that the commercial extract is a rich source of "that vitamin which will restore to normal growth rats on a diet devoid of water-soluble growth-promoting factors" and that the vitamin is derived from the unmalted flour.

The concentrated water soluble fraction of milk as a source of vitamin B, G. C. SUPPLEE, O. D. DOW, and G. E. FLANIGAN (*Jour. Dairy Sci., 11 (1928), No. 5, pp. 420–425, pl. 1, figs. 2*).—The water-soluble solids of milk are shown to compare favorably with dried brewery yeast as a source of vitamin B. The solids were prepared by removing the fat or cream by skimming, the casein by heating with a suitable precipitant, the lactalbumin by coagulating with heat, a considerable proportion of the insoluble calcium phosphate and the greater part of the milk sugar by crystallization, and concentrating the residual liquid to dryness. Data are reported on the composition of the milk solids and of the water-soluble fraction thus prepared.

Antineuritic yeast concentrates.—IV, The further purification of yeast vitamin B_1 (curative), H. W. KINNERSLEY and R. A. PETERS (*Biochem. Jour., 22 (1928), No. 2, pp. 419–433*).—In this report of a continuation of the investigation previously noted (E. S. R., 59, p. 294), the authors use the term yeast vitamin B_1 (curative) for the antineuritic vitamin which they had previously called torulin.

The studies reported include further attempts at purifying and concentrating the active material at the stage of its extraction with N/10 HCl from charcoal on which it has been absorbed at pH 7; studies on the solubility, stability, and chemical behavior of the various fractions; and a comparison with the rice vitamin B_1 (protective) of Jansen and Donath (E. S. R., 57, p. 489) and Eijkman (E. S. R., 58, p. 195).

Attempts to concentrate the material by further adsorption on Norite at pH 7 gave poor and uncertain yields. It was found, however, that at pH 4 substances other than the vitamin are removed with increased activity to an activity of 0.1 mg. per day. Beyond this point the reaction is as yet uncertain. The standard technic followed is, however, alcohol fractionation of the N/10 HCl extracts after removal of all traces of metals and sulfur with barium chloride, sodium hydroxide, and hydrogen sulfide as previousely described. Although very active fractions have been obtained by the use of silver nitrate as described by Seidell (E. S. R., 48, p. 611), the method has not always proved reliable. The use of phosphotungstic acid as precipitant with the preliminary adsorption step with charcoal as suggested by Jansen and Donath gave fractions of activity of from 0.7 to 0.8 mg. per day, but with marked losses, particularly when acetone was used as a solvent. The authors are of the opinion that "precipitation by phosphotungstic acid is a genuine property of the active principle, because it has never been possible to regenerate any activity in the filtrates." With chloroplatinic acid very active preparations have been obtained, but with variable yields and large losses, some of which are accounted for by activity in the filtrate.

The solubility of the active material was shown to vary with the activity of the preparation and with the H-ion concentration of the solution treated with the alcohol. The active principle was soluble in absolute alcohol, even in nearly neutral solution, but insoluble in chloroform, carbon tetrachloride, ether, acetone, or ethyl acetate.

The stability to alkali appeared to depend upon various factors. One-hour's heating with N/2 NaOH completely inactivated a fraction of 0.059 mg. activity, but heating with N/10 NaOH at an activity of 3.0 mg. did not lower the activity. Alcohol and hydrogen peroxide accelerated the destruction by alkali. It is considered advisable to carry out any alkaline stage in the process of concentration and purification at a low temperature and in the absence of alcohol. In general the active material proved stable to oxidizing agents and fairly resistant to reproducing agents.

It has been found possible to prepare active fractions from brewer's yeast. the yields thus far obtained being within the limits of those obtained with baker's yeast but upon the low side.

Vitamin C in fresh grass (Lolium perenne; English rye) and the iron, calcium, and phosphorus metabolism and the weight of various organs in scurvy [trans title], E. BROUWER (*Ver. Exploit. Proefzuivelboerderij Hoorn, Verslag, 1926, pp. 19–40, pls. 5, figs. 3; Ger. abs., pp. 39, 40*).—Essentially noted from another source (E. S. R., 58, pp. 90, 693).

The assay of the antirachitic vitamin D, K. M. SOAMES and J. C. LEIGH-CLARE (*Biochem. Jour., 22 (1928), No. 2, pp. 522–527*).—Attention is called to the fact that many basal diets used in vitamin D experiments are not properly balanced as regards other factors and consequently do not satisfy the primary requirement followed in the determination of other vitamins. In an attempt to discover a satisfactory basal diet containing adequate vitamin A and no vitamin D, an examination has been made of three materials, wheat embryo, hog millet, and alfalfa meal. The wheat embryo had been reported by Hume (unpublished) as satisfactory, while Steenbock, Nelson, and Black (E. S. R., 52, p. 804) found hog millet to be satisfactory and alfalfa unsatisfactory as sources of A unaccompanied by D. Four diets were used. Diet F, considered complete in all other respects but devoid of both A and D, consisted of wheat starch 50, inactivated casein 20, cottonseed oil 15, marmite 5, McCollum salt mixture (185) 5, lemon juice 5, and distilled water 50 parts by weight. In the other three diets vitamin A was furnished respectively by 20 per cent wheat embryo, 30 per cent hog millet, and 1 per cent alfalfa meal, the amounts of starch and casein being modified to furnish in all cases 50 per cent carbohydrate and 20 per cent protein on the dry basis.

These diets were tested on groups of rats about 4 weeks of age and weighing from 40 to 50 gm. at the beginning of the experiment. In addition one group received diet F with 20 mg. daily of cod-liver oil and four other groups the four diets with the cottonseed oil irradiated. Each group consisted of 4 animals and the diets were continued for 30 days. Data are reported on the individual animal's gain in weight and analyses of bones (femur, tibia, and fibula), including the A : R ratio.

The data showed wide variations for the individual animals for each group, but no greater variations in the weight increase than in the percentage of ash. The rats receiving hog millet or wheat embryo as the source of A had no greater proportion of ash in their bones than those on the basal diet alone. Those receiving alfalfa had a higher percentage of ash than the control group, but a lower growth gain than the group receiving millet or wheat embryo.

It is concluded that alfalfa meal contains too much vitamin D for use in the basal diet, but that with wheat embryo or hog millet as a source of vitamin A the growth curve of the animals can be used in the estimation of vitamin D.

The detection of the antirachitic factor in grass grown in the dark on an artificial nutrient solution, II, W. Völtz and W. Kirsch (*Biochem Ztschr., 193 (1928), No. 4-6, pp 281-284, figs. 2*).—The authors have confirmed previous observations on the presence of vitamin D in grass grown in the dark on garden soil (E. S. R., 57, p. 896), and have obtained similar results with grass grown in the dark in sterile nutrient solutions. It is concluded that the active substance which brings about the healing of rickets is not taken up from the soil through the plant roots but is formed during the metabolism of the plant itself.

Knowledge of D-vitasterin.—I, The activation of cholesterol [trans. title], A. Jendrassik and A. G. Keményffi (*Biochem. Ztschr., 189 (1927), Nos. 1-3, pp. 180-190*).—The authors advance the theory, based on a repetition of much of the work of Hess, Windaus, and others, that cholesterol owes its property of becoming antirachitic on irradiation to the presence not of ergosterol but of water of crystallization. Experiments are reported in which cholesterol was irradiated, the active fraction removed, the inactive fraction activated by irradiation, and the process repeated a third time, and other experiments in which cholesterol, carefully freed from water of crystallization, was shown to be incapable of activation.

Metabolism in scurvy.—I, The lactic acid excretion of scorbutic guinea pigs, H. L. Shipp and S. S. Zilva (*Biochem. Jour., 22 (1928), No. 2, pp. 408-415, figs. 3*).—Using the method of Clausen (E. S. R., 47, p. 716), the authors have determined the lactic acid content of the urine of young and adult guinea pigs on a scorbutic diet, preceded by a period on a complete diet. Although the decline in weight preceding death from scurvy was accompanied by polyuria with resulting increase in lactic acid, this was also true of guinea pigs losing weight on a restricted complete diet. It is concluded that scurvy causes no alteration in lactic acid metabolism.

TEXTILES AND CLOTHING

The structure of individual fibers, C. F. Goldthwait (*Amer. Dyestuff Rptr., 17 (1928), No. 15, pp. 565-571, figs. 10*).—Recent studies on the structure and behavior of textile fibers are reviewed.

Chemical technology of cotton, R. Haller. **Mechanical devices for improving cotton textiles,** H. Glafey (*Chemische Technologie der Baumwolle. Mechanische Hilfsmittel zur Veredlung der Baumwolltextilien. Berlin: Julius Springer, 1928, pp. XIV+711, figs. 266*).—The first section of this work (pp. 1-495) deals with the chemical technology of cotton, discussing raw cotton, the bleaching, mercerization, dyeing, and printing of cotton, the printing of rayon, staple fibers and similar materials, and the finishing of cotton fabrics and other goods. The second section (pp. 497-704) treats of machinery and other devices and their utilization in washing, bleaching, mercerizing, dyeing, drying, printing, singeing, fulling, calendering, pressing, steaming, and other processes in the finishing of cotton fabrics.

Practical method and new gage developed for measuring quantity of nap on Canton flannel, F. W. Cartland (*Textile World, 74 (1928), No. 4,* *pp. 35, 36, 41, figs. 6*).—The gauge described and illustrated and the method outlined is said to give a more exact means of determining the quantity of nap on a napped flannel than the present method of visual comparison. It also enables several flannels to be compared without bringing them together.

The estimation of China clay in sized cotton goods, G. SMITH (*Jour. Textile Inst., 19 (1928), No. 8, pp. T323–T328*).—A simple, direct method is outlined.

Action of alkalies on cellulose, G. W. BLANCO (*Indus. and Engin. Chem., 20 (1928), No. 9, pp. 926–930, figs. 13*).—This review, covering 66 titles, summarizes part of the work during the last 80 years on the action of alkalies on cellulose, being limited chiefly to the mercerizing effects of caustic soda solutions on cotton cellulose.

Contribution to the technology of mercerization, J. WALTHER (*Beitrag zur Kenntnis der Technischen Mercerisation. Diss., Badischen Tech. Hochschule "Fridericiana," Karlsruhe, 1927, pp. 47, pls. 7, fig. 1*).—The investigations reported in this dissertation were largely concerned with the fundamentals of mercerization of raw cotton and the measurement of luster.

The chemistry and physics of artificial silk, R. O. HERZOG (*Jour. Textile Inst., 19 (1928), No. 6, pp. P138–P146, pl. 1*).—The current theories relating to the physical and chemical properties of rayon are discussed from the viewpoint of principles established from X-ray investigation of fibers.

The dyeing of Manila fiber, F. GROVE-PALMER (*Textile World, 74 (1928), No. 8, pp. 49, 51, 109*).—Methods are outlined briefly for the dyeing of abaca.

A contribution to the study of the microbiology of wool, R. BURGESS (*Jour. Textile Inst., 19 (1928), No. 8, pp. T315–T322*).—The work of the British Research Association for the Woollen and Worsted Industries on bacteria and fungi attacking wool, described briefly, was concerned with the merits of different antiseptics, the antiseptic values of dyestuffs, discontinuous steaming, reaction of the fiber and moisture relationships of the fungi and bacteria. Most of the work reported is considered of a preliminary nature. Thirteen titles are listed.

X-ray investigation of woollen samples, T. D. THREADGOLD (*Jour. Textile Inst., 19 (1928), No. 6, pp. T233–T236, figs. 2*).—Exposure of wool to X-rays gave no evidence for assuming that the wool fibers and yarns examined have a crystalline structure. If such structure exists it must be in the form of extremely minute crystallites individually too small to give a characteristic X-ray diffraction pattern, or else the lattice spacing constant d is less than 0.77 angstrom unit.

The literature of keratin (the principal constituent of wool), J. BARRITT (*Brit. Research Assoc. Woollen and Worsted Indus. Pub. 55 (1926), pp. 16*).—This review covering about 59 references discusses the analysis, constitution, reactions, degradation products, uses, and general properties of keratin.

Angora rabbit fur in knitting, W. DAVIS (*Textile Recorder, 46 (1928), No. 546, p. 75, figs. 7*).—A brief account of methods of obtaining the fur and characteristics of the fiber and yarn spun therefrom.

Influence of laundering on cotton fabrics, P. E. RAASCHOU and V. A. LARSEN (*Indus. and Engin. Chem., 20 (1928), No. 9, pp. 916–922, figs. 6*).—Laundering tests at the Polytechnical College, Copenhagen, Denmark, were made to determine the weakening effects of washing cotton materials with preparations containing perborates and other bleaching agents. The fabrics tested included medium heavy unbleached and light cotton cloths, both clean and soiled.

Boiling cotton fabric, under definite conditions, with solutions containing soda 1 per cent, sodium hydroxide 0.5, water glass 1, or soap in hard water 1 per cent resulted in the tensile breaking strength decreasing with an increasing number of boils, and the amount of such weakening increased in the order these solutions are named. A mixture of soap 0.33 per cent, soda 0.33, and water glass (0.04 per cent in the lye) produced a very slight weakening. Addition of a small quantity of sodium perborate (0.01 per cent of the lye) to these solutions increased the weakening, which in certain cases, however, was slight in comparison with the weakening influence of the pure laundering agent. Increasing quantities of perborate (0.01 to 0.15 per cent of the washing lye) added to the standard lye caused a pronounced loss in strength. Special soiling of the fabric caused further weakening when the boiling was done with the standard lye plus 0.05 per cent of perborate. Boiling with distilled water with a trace of copper resulted in an especially pronounced weakening when the standard lye plus 0.05 per cent of perborate was used. Boiling with a lye retarding the perborate dissociation resulted in a low degree of perborate weakening, and the reverse was also noted.

Other observations were made on ash and encrusted substances in washed fabrics, loss of weight of fibrous substances by washing, and on the relative influences of various weakening factors on resultant strength loss.

Dresses for the little girl, M. Campbell (*U. S. Dept. Agr. Leaflet 26 (1928), pp. 8, figs. 10*).—An illustrated leaflet of simple designs for school, play, and party dresses for little girls, with practical directions for the selection of materials and trimmings and for the preparation of the garments.

MISCELLANEOUS

Report of Holly Springs Branch Experiment Station, 1927, C. T. Ames and O. B. Casanova (*Mississippi Sta. Bul. 253 (1927), pp. 31, figs. 5*).—The experimental work reported is for the most part abstracted elsewhere in this issue.

Williston Substation Report for April 1, 1927, to March 31, 1928, E. G. Schollander (*North Dakota Sta. Bul. 219 (1928), pp. 28, figs. 12*).—The experimental work recorded is for the most part abstracted elsewhere in this issue. Meteorological data for 1927 are also included.

NOTES

Connecticut Storrs Station.—Philip K. Hooker, assistant in agricultural economics, has resigned to accept a commercial position.

Iowa College and Station.—The new dairy industry building has been completed, likewise an insectary and a brick barn for seed storage and seed investigations.

H. A. Bittenbender, professor and chief in poultry husbandry, has resigned to engage in commercial work. C. A. Burge has resigned as instructor in animal husbandry to become assistant professor of animal husbandry extension in the Pennsylvania College.

Michigan College.—An agricultural lecture foundation, under which plant breeders will be brought to the college for a series of lectures each year, has been established in memory of the late Frank A. Spragg, crop specialist from 1907 to 1924.

Association of Official Agricultural Chemists.—The forty-fourth convention of this association was held in Washington, D. C., October 29, 30, and 31, 1928, with a large and representative attendance.

The program followed the usual lines, with three addresses of general interest. Of these, that of the retiring president, Dr. Oswald Schreiner of the U. S. Department of Agriculture, was concerned with the rôle of the rarer elements in soils, foods, and drugs. Improved analytical methods, Dr. Schreiner declared, have demonstrated the presence in the plant and animal organisms of traces of elements not formerly recognized, and more refined experimental methods are showing the biologically essential nature of many of these. He mentioned the work of some of the experiment stations and of the U. S. Department of Agriculture on the necessity for normal plant growth of minute quantities of manganese, copper, boron, and other elements, and pointed out that a new and important field of activity and research is being opened up in which great refinement of method will be essential.

The annual address of Dr. Harvey W. Wiley, honorary president of the association, consisted of an account interspersed with illustrative comment in characteristic vein of the life and work of Louis Pasteur.

The greetings of the U. S. Department of Agriculture were presented by Dr. A. F. Woods, Director of Scientific Work, who reminded the association that its work "stands at the foundation of our program for purity and honesty in foods, drugs, animal feeds, fertilizers, insecticides and fungicides, and a host of other things that have important relation to our general welfare." Dr. Woods also pointed out that the new era of more exactness in chemical and other science and the consequent reexamination of old fields, together with the opening up of new fields, is imposing a special responsibility on the association for guidance.

The officers elected for the coming year are as follows: President, H. B. McDonnell of Maryland; vice president, E. M. Bailey of Connecticut; secretary-treasurer, W. W. Skinner, U. S. D. A. Bureau of Chemistry and Soils: and new members of the executive committee, Dr. Schreiner and J. W. Kellogg of Pennsylvania.

Association of Feed Control Officials of the United States.—This association met in Washington, D. C., November 1 and 2, 1928, for the consideration of definitions of feed stuffs and their constituents and related problems. The president, P. H. Smith of the Massachusetts Station, presided. The newly elected officers consist of G. S Fraps of the Texas Station, president; A. W. Clark of the New York State Station, vice president; L. E. Bopst of the University of Maryland, secretary-treasurer; and G. L. Bidwell of the Food, Drug, and Insecticide Administration, U. S. D. A., as a member of the executive committee.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 9, the following sectional officers were elected at the Washington meeting, November 20–22, 1928: Agriculture, L. N. Duncan of Alabama, chairman, R. L. Watts of Pennsylvania, vice chairman, and L. E Call of Kansas, secretary; engineering, C. R. Jones of West Virginia, chairman, and R. A. Seaton of Kansas, secretary; and home economics, Martha Van Rensselaer of New York, chairman, and Rachel H. Colwell of West Virginia, secretary. In the three subdivisions of the section on agriculture Cornelius Betten of New York and E. J. Iddings of Idaho were chosen as chairman and secretary, respectively, for that of resident teaching, P. F. Trowbridge of North Dakota and W. J. Morse of Maine for experiment station work (with E. W. Allen of the Office of Experiment Stations again as recording secretary), and S. B. Nelson of Washington and T. R. Bryant of Kentucky for extension work.

In the standing committees, S. B. Earle of South Carolina, H. L. Kent of New Mexico, and Edith P. Chace of Pennsylvania were appointed for three years on the committee on instruction in agriculture, home economics, and mechanic arts vice J. H. Skinner of Indiana, H. S. Boardman of Maine, and Ava B. Milam of Oregon. R. S. Shaw of Michigan and E. G. Peterson of Utah succeeded C. W. Pugsley of South Dakota and Ruth A. Wardall of Illinois for three-year terms on the committee on college organization and policy, while a vacancy for one year was filled by the appointment of J. A. Burruss of Virginia. C. A. Mooers of Tennessee was reappointed to the committee on experiment station organization and policy, while J. C. Kendall of New Hampshire was succeeded by W. L. Slate of Connecticut. On the committee on extension organization and policy, I. O. Schaub of North Carolina and A. E. Bowman of Wyoming succeeded P. V. Maris of Oregon and J. R. Hutcheson of Virginia. A. M. Soule of Georgia was reappointed to the committee on military organization and policy, while T. O. Walton of Texas was succeeded by F. L. McVey of Kentucky. C. A. Lory of Colorado replaced E. A. Hitchcock of Ohio on the committee on engineering experiment stations.

In consequence of its inclusion as a standing committee, the committee to give attention to the radio problem was reorganized on a three-year basis. The membership will consist of H. J. C. Umberger of Kansas and B. W. Ellis of Connecticut for three years, F. G. Helyar of New Jersey and T. B. Symons of Maryland for two years, and D. C. Faber of Iowa and R. W. Goddard of New Mexico for one year.

On the joint committee on projects and correlation of research, F. B. Morrison of New York was succeeded by T. P. Cooper of Kentucky. W. J. Morse of Maine was appointed to the joint committee on publication of research vice R. W. Thatcher of Massachusetts.

No change was made in the special committees on Purnell research projects with the exception of those on rural home management studies and the factors which influence the quality and palatability of meat. On the first of these committees, Margaret M. Justin of Kansas and Greta Gray of Nebraska were succeeded by Helen Canon of New York and Mary F. Taylor of Kansas, while to the latter committee C. W. McCampbell of Kansas was added.

EXPERIMENT STATION RECORD

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Discussions of research at the 1928 convention of the Association of Land-Grant Colleges and Universities centered around four main topics. These included the relations of the experiment stations to fundamental research, administrative responsibilities in the functioning of research, especially as regards the director's office, the status and outlook of interinstitutional cooperation and coordination of work, and the specific opportunities for research in some of the newer fields of inquiry.

Valuable contributions were made in all of these and other matters, but the address which attracted the widest interest and proved among the most stimulating of the entire convention was perhaps that of Dean E. M. Freeman, entitled The Agricultural Experiment Station an Institute for Fundamental Research in Rural Affairs. In this address Dean Freeman drew attention to the proposals brought forward in some quarters for the creation under private auspices of institutes of research along various lines related to agriculture, and to the argument sometimes presented in justification of such institutes that agricultural research as carried on by the experiment stations must be too practical and immediate in its objects to be really fundamental. Such a view, in Dean Freeman's opinion, was merely "a rechristening of the pure science idol as fundamental science," an attitude he regarded as untenable. "The conclusion which I am forced to draw is, first, that any attempt to exclude fundamental problems from applied science . . . gives a distorted picture of the problems in science, of methods of research, and the history of its growth; second, that fundamental results of the most fundamental importance are not at all incompatible with research in applied fields, provided the investigator keeps on digging at the bottom of the shaft and not merely enlarging its entrance."

"I believe," he went on to say, "an agricultural experiment station should engage in solving the practical problems of agriculture; I believe that it should render real service to agriculture and thus to the whole people; I believe that it should extend its knowledge to all the people by every legitimate method; and last but not by any means least, I believe it should contribute generously to the investigation of those deeper problems which lie at the bottom of our present knowledge in every field of agriculture. Then, indeed, will it be able to render the greatest possible service to agriculture through a more profound knowledge and a more fundamental solution of practical problems."

Dean Freeman made it clear, however, that by no means all of present-day experiment station work is entitled to be classed as fundamental. On the contrary, in his view, " no experiment station that encourages shallow digging or a gleaning process in its research to the exclusion of fearless fundamental investigations, no experiment station that demands of its staff that all of its results be expressed or understandable in the simplest terms of extension circulars, is worthy of the name of an institute of fundamental research or, for that matter, of a real experiment station."

Under the title of Administrative Responsibilities in the Functioning of Research, Dr. E. W. Allen, Chief of the Office of Experiment Stations, laid down as basic the proposition that " the final responsibility for the way in which a station discharges its research functions resides with the director. For he it is who brings together or develops a working staff, maintains the standards of the research done, and is accountable for the effective operation of the organization. Success in the administration of research depends on realizing these responsibilities, and then exercising them effectively."

Admitting that in practice the director rarely selects more than a part of his station staff and that most stations comprise men and women of varying grades of ability and experience, Dr. Allen believed that the executive can exercise large influence by personal contacts and wise guidance of the diverse material with which he has to deal. " It does not require extensive technical knowledge in the various subject matter branches for an administrative officer to determine, for example, the nature of a worker's controlling interest and how far this interest arouses an intellectual impulse; to judge whether he is a routine worker busy gathering data indiscriminately, or is exercising what Sir William Bragg refers to as 'well informed concentration on essential details'; whether he is a good technician of the craftsman type, or one whose mind constantly 'tries to reach out beyond what can be seen and heard'; whether he has the originality to stand alone or must follow others. Every director who studies his force intimately will be able to distinguish those of the technician type from those of the imaginative research type; and as an administrative officer he can ill afford not to recognize these distinctions, for they are essential in providing for a research program. This will enable him to apply stimulation and encouragement where it is likely to be helpful, and to regulate supervision and latitude of freedom; it will furnish the basis for adaptation of individuals to their respective types of work, and for the introduction of new material into the working staff to meet particular needs."

Large opportunity for leadership also comes to the director in the initiation of projects. "These usually originate with the investigators after conference with the director, but their final acceptance is an administrative responsibility. Because they are so basic as affecting policy, their approval or rejection is an important administrative function." Among the types of project defects which are often encountered are still too many "blanket projects," a failure to take account of previous work or the general status of the subject, defective technique or inadequate procedure, demonstration and purely routine proposals, and inadequate available support. All of these conditions call for close administrative supervision. There is also a need for the formulation of definite research programs and coordination of the discoveries made by the stations as a group into a homogeneous whole.

In taking care of these things, Dr. Allen maintained that while "the director himself may not be able to attend to all the details and contacts necessary, . . . he can provide for them without decentralization of authority. This is good organization. He will rarely function as a specialist, but rather as an organizer having a broad grasp and sympathies, intimately acquainted with the general principle and essentials which pertain to all research. He will exercise his authority to see that plans are properly made and properly considered; he will leave the details of execution to the specialists, but he will expect to know whether or not the projects are being properly carried out. These things he can do without limiting individual initiative and responsibility, or losing the confidence and support of the staff."

Another view of the station director, his relationships, and his responsibilities was set forth in an address by Dr. S. B. Doten of Nevada, based largely upon findings accumulated in the survey of the land-grant institutions in progress under the auspices of the U. S. Bureau of Education. Director Doten called attention to the many extraneous duties, such as regulatory, conservation, and the like, frequently imposed upon the station head, as well as the complex relationships with the teaching and extension work of his institution and with the research work of other stations and the U. S. Department of Agriculture. These conditions serve to complicate the problem of the choice of the director and the progress of his research program. The need of knowledge of the individual capabilities of his staff and of the history and relations of each project was clearly recognized, and Director Doten joined with Dean Freeman in a strong plea for full recognition by directors of the need of large faith in the research staffs and much patience in the working of apparently blind leads. Especially, in his opinion, did the position of director demand considerable time for study and full consideration of problems unhampered by the pressure of unrelated duties.

The need of continuity in research was indicated by several speakers, but it remained for the committee on experiment station organization and policy to bring out as one phase of its report the important distinction between continuity of aim and continuity of method. Pointing out that persistence in the pursuit of an objective does not necessarily mean adherence to a fixed plan or set-up, the committee raised the question whether the continued accumulation of data and the prolongation of experiments over a period of years was as necessary in some fields to-day as in the pioneer stage. Set procedure, it believed, might be merely a cloak for routine and for failure to make progress, and perseverance under such conditions may be quite unwarranted. "Unless the subject is gradually being developed and unfolded, continuity is misapplied, for the essence of research is progress."

With the more definite objectives and more direct attack of the present time, the committee declared that "continuation on a conventionalized plan needs to justify itself at the present stage. As an evidence of industry and patience it is not sufficient; it implies expectations. It is important, therefore, to take a frank account of stock. Workers themselves need to take a critical attitude toward their work, and administrators need sooner or later to assure themselves that the continued prosecution of a subject is proving worth while. Such work needs to be dealt with with reasonable patience, but with critical judgment based on evidence of growth."

The subject of cooperation in research has long been a favorite with the program makers of the association, and the 1928 convention proved no exception in this respect. Under the title of Cooperation between the Department of Agriculture and the Experiment Stations, Dr. A. F. Woods, Director of Scientific Work, pointed out that not all research lends itself to profitable cooperation, and that manifestly some types can be better handled in a cooperative way than others. "Naturally much investigation will continue to be done on an individual, personal basis, depending on the initiative, imagination, and insight of the individual, and developing in proportion to his ability to construct hypotheses and grasp the suggestion of a new idea. It is not anticipated or advocated, therefore, that workers should join hands in carrying out all their investigations, even those in which interest may be widespread."

None the less, he believed that the large field open to cooperation is becoming more and more clearly evident. Given a problem in which the participating parties have a mutual interest and responsibility and each has a share to contribute to the investigation, "organized effort may be more comprehensive, more effective, and more rapid in accomplishment. Moreover, cooperation aims to avoid unwarranted and inadvertent duplication, to provide for replication where necessary to obtain data of sufficient range and volume, and to promote systematic and progressive conduct of the work, and thus provides a more comprehensive organized attack upon complex problems."

Cooperation in research, however, as Dr. Woods well said, is more than a form of action. "Its real basis must be a spirit or desire to cooperate, with the give and take always necessary in any unselfish effort for the common good. Unless this spirit is present, any cooperative enterprise will be of doubtful value and short lived. . . . Failure to recognize this principle is the cause of most of the friction."

The report of the joint committee on projects and correlation of research, presented by its chairman, Dr. F. B. Mumford of Missouri, drew attention to the unusual stimulus to cooperative enterprises occasioned by the passage of the Purnell Act. Records at the close of the fiscal year 1927–28 showed over 900 active research projects carried on in a cooperative way between the stations or with the Department of Agriculture. This represented over one-seventh of the total number of station projects and included 20 or more regional cooperative studies. All of the stations were represented, in 5 cases by over 35 projects each.

In spite of this encouraging numerical evidence of the growth of cooperation, the committee reported that "considerable remains to be done in strengthening the cooperative movement and giving the various features more tangible form. In numerous instances the cooperation is rather loose and ineffective; it is lacking in organization and does not go much beyond a mutual understanding, without working agreements. Frequently it is quite informal, representing verbal agreements entered into between individuals, while in other cases there is little that binds the workers together in carrying out a common purpose.

"Relatively few stations have embraced the national projects, especially in some of the newer lines. In the large majority of cases, investigators have set up projects of their own on independent and unrelated bases. In other cases the so-called cooperation is to a considerable extent a paper affair, with little coherence and with indefinite conformity to a working plan. There is not yet the concerted effort which was looked for after these cooperative projects were outlined. Reliance has been placed to a large degree on the interest of individuals in cooperation, and care exercised not to transgress individual initiative. Apparently the subject has not been one with which administrative officers have concerned themselves very definitely as a matter of policy."

The committee expressed very definitely its belief that much of the responsibility in the matter rested upon the station director. It is he who needs "to consider how the work of his station can best be carried forward. and this naturally will involve the utilization of his force and facilities to best advantage, avoiding duplicating efforts of other stations, except on a considered plan, and taking the largest advantage of the results of their progress. Unless he realizes the opportunity and seeks constantly to apply it where it is advantageous, cooperation and coordination are likely to remain largely in abeyance as far as his station is concerned."

Too often, the committee reported, directors have not realized the opportunities which interinstitutional cooperation offers for utilizing most effectively the diverse qualities and aptitudes of research workers of varied types. "A wide variety of aptitudes is required in agricultural research, involving experience, manual dexterity, and practical knowledge, as well as mental ability and imagination; and in a great variety of cases these can be employed in collaborative enterprises to very great advantage, hastening the advance and greatly extending the reach which individuals could expect to attain working single-handed. Too often, it is believed, workers are encouraged or passively permitted to carry on their experiments and investigations alone and without relation to the work of others. when their efforts might more profitably be joined with those of others either through definite cooperation or coordination."

In the ensuing discussion some divergence of views was brought out as to some of these matters. The importance of administrative sympathy and support was conceded, but the feeling was expressed that real cooperation is often a matter of slow growth, working from below upward and involving the careful cultivation of relations. Frequent opportunity for conferences and acquaintance was cited as helpful in this direction. The basis of cooperation, it was thought, must be a true community of interest and its inspiration a recognition of that interest strengthened by a personal urge. Mention was also made of the need of careful planning of cooperative projects. The field should be surveyed and allotted, methods well worked out in advance, and the stage properly set for definite and concerted action.

Failure to take account of some of these requisites, it was intimated, had done much to imperil otherwise promising ventures in the past and retard progress appreciably.

Perhaps the most significant development of the discussion as compared with those of previous years was the evidence of increasing first-hand knowledge of cooperation and its practical workings. In place of more or less academic theorizing, the session took on the aspect of an experience meeting. It is because of the lengthening background of definite undertakings that the dominant note of optimism is so encouraging.

Another phase of cooperative research received consideration by the committee on experiment station organization and policy, that of cooperation with commercial enterprises and interests. The committee emphasized the essentially public nature of agricultural research, and maintained that commercial agencies that have a particular interest in such work because of its close relation to their own activities "can usually best serve their own interests, those of the station, and of the general public by using their influence to secure for the station adequate financial support from public funds." At the same time the committee recognized that when public funds are not available for the conduct of research of a special character for which there is urgent and immediate need, "private grants from commercial agencies may make possible the securing of prompt results and thus serve both these interests and those of the public. There is ample evidence that experiment stations and the farmers whom the stations serve have profited materially by contacts and cooperation with commercial enterprises and interests. The committee feels, therefore, that under certain definite limitations and conditions it is proper for the experiment stations to accept grants for agricultural research from such agencies."

The limitations which the committee suggested were the requirement that any privately-supported research must be of general importance and in the station's immediate field, that the cooperation should be strictly institutional and handled through the regular administrative channels, and that carefully worded project agreements safeguarding the public interests should be drawn. Results, it was set forth, should first be made public through the regular station channels whether favorable or unfavorable to the cooperating agency.

Another problem of relationships taken up by the same committee was that of part-time employment or acceptance of fees by individuals for extra services rendered to outside agencies. Such compensation or employment was deemed generally inadvisable for full-time research workers on a station staff, and where permitted there should be a definite understanding as to the nature of the service, the time required, and the compensation. Compensation for writing, it was suggested, should be a matter of administrative control, should exclude articles promoting the sale of specific commodities, and should not deal with unpublished research material of the station or commit the institution to any practice or policy without approval of the regular authorized agency.

The large amount of attention given in the subsection program to the consideration of problems peculiar to the newer fields of inquiry was one of the distinguishing features of the convention. The outlook and opportunities in agricultural economics, rural sociology, home economics, and agricultural engineering were all discussed in turn, and a paper presented by Dr. Henry Granger Knight, Chief of the Bureau of Chemistry and Soils of the U. S. Department of Agriculture, set forth the possibilities for broadening the market for agricultural products through research designed to bring about a wider utilization of farm wastes and residues.

Dr. Knight cited the manufacture of sugar cane bagasse into fiber board and the conversion of the residues of the corn crop into various products as instances of the large potential markets which may be made available through research along chemical, plant breeding, economics, engineering, and related lines. A recent survey by his bureau indicated, he declared, that "there is an annual production in the United States of about 100,000,000 tons of cornstalks, 115,000,000 tons of cereal straws, 20,000,000 tons of corncobs, 3,000,000 tons of oat hulls, 18,000,000 tons of cotton stalks, 1,800,000 tons of cottonseed hulls, 2,200,000 tons of flax straw, 70,000 tons of peanut hulls, and 500,000 tons of sugar cane bagasse, making a grand total of 260,570,000 tons of agricultural wastes and residues for which little use has been found. This great annual supply of material challenges the best talent of the country to perfect the utilization of this waste, and therein lies one important means for the solution of the so-called farm problem."

Under the title of Progress and Problems in Home Economics Research, Miss Sybil L. Smith of the Office of Experiment Stations submitted a detailed statement of the active Purnell projects in home economics on November 1, 1928. Forty-two States were included in this list, with over 100 projects, an allotment of $251,474, and about 100 project leaders and assistants. A wide range in activity was revealed between the different States as evidenced by medium, maximum, and average allotments of $824, $14,600, and $5,978. As in many instances the development of a research program has been limited by inability to find suitably trained workers, the recognition given in most States in the allotment of Purnell funds was deemed very gratifying. A less favorable condition is the insignificant support still accorded home economics research from State funds. There is also an unduly heavy concentration of work in the field of food and nutrition, largely corresponding to the preponderance of well trained workers, but there are indications of an increasing desire to develop the allied fields of textiles, household equipment, and especially the economic and social problems of the home. Among other administrative difficulties mention was made of the break in continuity of research incident to the nine months' schedule still in vogue for home economics workers at some institutions and the need for home economics research divisions within the stations themselves. On the latter point, Miss Smith concluded as follows: "It seems to me that the greatest single factor upon which the growth of home economics research at the land-grant colleges and universities will depend is the establishment of close relationships between director and research staff everywhere, regardless of seemingly difficult administrative obstacles to such a relationship. It is only through a feeling of joint responsibility that the experiment stations and the home economics divisions can find themselves, in the fullest sense of the word, in this new field of research."

A study of experiment station work in agricultural engineering presented by Mr. R. W. Trullinger of the Office of Experiment Stations indicated an almost unlimited field for participation in existing research programs. "Such agricultural engineering participation," he believed, "in the study of agricultural problems may take the form of the manipulation of engineering principles to introduce control into experiments, the testing or comparing of available equipment or the development of new equipment on the basis of known standards or established requirements, or original research to establish the fundamental principles involved in operations to provide a basis for the rational development of the necessary equipment. Success in this work appears to call for the effective coordination of the efforts of subject-matter specialists in agriculture with those of agricultural engineers in the study of specific problems."

A need of joint studies in the solution of many economic problems was expressed by Mr. L. A. Moorhouse, who discussed the question of where emphasis should be placed in agricultural economics research. Speaking with special reference to Colorado conditions, Mr. Moorhouse argued for a large share in the program for studies in farm and ranch organization, marketing and transportation, land economics, farm finance, and cooperation.

Taking as his title Rural Sociology as a Field of Research in the Experiment Station, Prof. Wilson Gee of the University of Virginia saw in the development of social sciences the same possibilities of aid in the approach to a solution of the economic, social, political, religious, and related problems of country life that the natural sciences have afforded in the solution of production problems. Rural sociology he believed to have been unduly retarded in assuming a position in the station program commensurate with its importance. Among the phases indicated as fruitful fields of inquiry, he cited population, rural migration, and community studies, standards of living, and rural institutions. On inclusion, rural sociology should be treated as applied sociology. In the study of concrete definite problems, it "will contribute greatly to the materials necessary for the planning of programs for the solution of the vexing social problems of rural life, and also will substantially enrich the science of general sociology."

That research in the newer fields is presenting numerous specialized problems, sometimes in more or less unexpected directions, may be inferred from the final report of President R. W. Thatcher of Massachusetts, retiring chairman of the joint committee on publication of research. This committee is primarily concerned with the publication of the *Journal of Agricultural Research* and reported that substantial progress had been made in securing the prompt publication of manuscripts submitted to it. In spite of this great advantage, however, little disposition thus far has been shown by institutions to utilize its columns for papers on either home economics or the social sciences. Only a single paper had been tendered along these lines as compared with about 50 per annum in the biological sciences. The need and desirability of a separate journal was therefore suggested to the incoming committee for study and report at the next meeting.

Taken as a whole, the interests of research were adequately represented at the 1928 convention. Less prominence was given it in the general sessions than on some occasions, but this was evidently without special significance, as there were plentiful indications that its importance was conceded as never before. The rearrangement of program permitted much more detailed consideration of specific problems by the group immediately concerned, and the increased opportunities thereby provided for discussion from the floor will doubtless be availed of even more freely as the new situation becomes better understood. This should be very helpful, for as was said on a previous occasion, "perhaps the station division meetings render no more useful service than in bringing together the administrative heads of the agricultural research work for conference on their common problems. The value of the meetings is therefore increased as the extent of participation is enlarged."

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The problem of physico-chemical periodicity, E. S HEDGES and J. E. MYERS (*London: Edward Arnold & Co., 1926, pp. 95, pls. 2, figs. 15*).—Defining periodicity, for the purposes of this monograph, as "the recurrence of some property or the accentuation of a property at regular intervals of time, distance, or other quantity" (such, for example, as intervals in the regularly increasing or decreasing concentration of a component of the system), the authors present a critical summary of the literature and a wide variety of periodic chemical reactions and states, contributing, in the opinion of F. G. Donnan, as expressed in the foreword which introduces the monograph, "by their own discoveries to the elucidation of the phenomena of periodic and pulsating chemical action" and suggesting "a very interesting and general hypothesis."

The modern calorimeter, W. P. WHITE (*New York: Chem. Catalog Co., 1928, pp. 194, figs. 16*).—Following a brief introduction indicating the scope and purpose of this book, its contents are as follows: Outline of the subject, the fundamental processes and measurements, methods in general, particular methods, particular apparatus, and applications to calorimeter design and the planning of installations. Considerable portions are devoted to estimates and computations concerning the attainable precision or reliability of various methods or designs in calorimetry.

Fruit pectin, W. A. ROOKER (*New York: Avi Pub. Co., 1928, pp. IX+170, pls. 6, figs. 2*).—This is a monograph on the commercial preparation and uses of pectin, including a résumé, by M. R. Daughters, of the patents covering its commercial manufacture and use. The divisions of the subject as here taken up are as follows: Source of pectin; various steps in manufacturing pectin; the leaching process; details of extracting the pectin; removing a justifiable amount of pectin—clarifying and cooling—enzymes; use of filter medium and carbon; testing jellies; powdered pectins; relative values of pectins; the evaluation of pectin raw material; new uses of fruit pectin; fruit pectin in confections; standards and definitions of preservers' products; the chemistry of jelly making; and patents on the manufacture and use of pectin.

The effect of successive generations of yeast on the alcoholic fermentation of cider, S. C. VANDECAVEYE (*Jour. Agr. Research* [*U. S.*], *37* (*1928*). *No. 1, pp. 43–54*).—The reduction of nutrients essential to the growth of yeast to a concentration so low as to render the beverage unfermentable was the object of this preliminary study at the Washington Experiment Station of the combined effect of heat coagulations at 45° C., and of the growing of two or three successive generations of yeast, upon the fermentability and beverage quality of freshly expressed cider.

The nitrogen and phosphorus contents of cider were found to be low and to be capable of reduction to traces only by the combined treatments mentioned. Nitrate or nitrite nitrogen was not detected at any time, but ammonia was always present in small quantities. A positive qualitative test for orthophosphates was also always obtained.

"Clear cider, containing 0.53 per cent of alcohol and possessing the natural flavor of unprocessed, freshly pressed cider, was obtained in a temporarily unfermentable form by the growth of three generations of yeast. The chief factors responsible for the temporary unfermentable condition of the cider were found to be the lack of nitrogen and phosphorus and not the effect of accumulated toxic products or of disease conditions of the yeast. It was observed that the temporarily unfermentable cider was subject to a limited amount of fermentation after seven days of incubation at the optimum temperature for yeast, and that this was probably due to the presence of traces of available nitrogen and phosphorus which were sufficient to maintain the life processes of a small number of yeast cells."

Allen's commercial organic analysis, Vol. VI, edited by S. S. Sadtler, E. C. Lathrop, and C. A. Mitchell (*Philadelphia: P. Blakiston's Son & Co., 1928, 5. ed., rev. and rewritten, vol. 6, pp. IX+658, figs. 5*).—The fifth edition of this volume of this widely known handbook deals with colorimetry, dyes and coloring matters, synthetic dyestuffs, and the analysis of coloring matters. Some of the earlier volumes of the present edition have been noted previously (E. S. R., 56, p. 110).

Soil acidity methods as applied to soil survey work, S. D. Conner, M. F. Morgan, and G. W. Conrey (*Jour. Amer. Soc. Agron., 20 (1928), No. 9, pp. 881-892*).—Methods for soil acidity determination are classified into two groups, (1) qualitative or roughly quantitative tests including the litmus paper test, Truog's test (E. S. R., 43, p. 622), and others, and (2) quantitative methods subdivided into four groups, (*a*) methods measuring the intensity of the acidity in terms of pH value, (*b*) methods giving a measure of the exchangeable hydrogen, depending upon the treatment of the soil with a solution of a salt of a strong acid and a strong base, (*c*) methods in which hydrolytic acidity is determined by treatment of the soil with a solution of a salt of a strong base and weak acid and subtracting from the acidity determined in extracts thus obtained the exchange acidity determined as above, and (*d*) methods measuring the capacity for base absorption by treatment of the soil with alkaline solutions or substances.

Examples of each of these types of procedure are discussed in relation to soil survey work. The conclusions, among others, are reached that "our modern views on base exchange have so modified our whole conception of soil acidity that no single determination will suffice to give us a complete picture of the relationships," and that "although the results of the different methods are generally expressed in pounds of calcium carbonate required per acre of 2,000,000 lbs. of soil, we know that there is no single soil acidity method which will apply to all soils and give us the optimum application of lime for different crops." The use of several types of methods is in this case also deemed advisable, and "the crop advisor will then need a large portion of experience and common sense."

A reference list of 31 titles is appended.

Methods for the determination of the amount of exchangeable hydrogen in soils, F. W. Parker (*Alabama Sta. Rpt. 1927, p. 9*).—Exchangeable hydrogen was determined in 12 soils by four methods, three of which gave nearly identical results as follows: (1) Exchangeable hydrogen was found equivalent to the difference between total exchange capacity and exchangeable base content. (2) Exchangeable hydrogen was found also equivalent to the quantity of barium hydroxide required to titrate the soil to pH 7.0. (3) Exchangeable hydrogen was further found determinable by leaching 10 gm. of soil with 250 cc. of normal neutral barium acetate solution and titrating the leaching to pH 7.0. The barium was found to replace in these processes all of the exchangeable hydrogen, leaving the soil reaction, after the washing out of the barium acetate, at a pH of approximately 7.0.

Avidity, the readiness with which exchangeable hydrogen is replaced by other ions, was determined by acting upon equivalent quantities of exchangeable hydrogen and acetic acid with an equivalent quantity of the base potassium. "The . . . hydrogen replaced by potassium was determined by titration, and the percentage replaced by potassium indicates the avidity of exchangeable hydrogen."

A comparison between complete and incomplete digestion of sprayed apple foliage in determining arsenic by the Gutzeit method, J. M. Ginsburg (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 588–592*).—This is a contribution from the New Jersey Experiment Stations in which it is reported that quantitative analyses for arsenic by the Gutzeit method on sprayed apple leaves have shown that partial digestion of the dried plant tissue with dilute nitric or hydrochloric acid gives as accurate results as complete digestion with concentrated sulfuric and nitric acids. The incomplete digestion method consumes considerably less time and costs less than the complete digestion method.

METEOROLOGY

Manual of meteorology.—Vol. II, Comparative meteorology, N. Shaw and E. Austin (*Cambridge, Eng.: Univ. Press, 1928, vol. 2, pp. [XL]+445, figs. 227; rev. in Geogr. Rev., 18 (1928), No. 4, pp. 693, 694*).—Volumes 1 and 4 of this manual have been previously noted (E. S. R., 57, p. 14; 43, p. 208). Volume 3 has not yet appeared.

Definitions and explanations of technical terms employed or referred to in meteorological literature precede the main text, which contains chapters on the influence of sun and space—some preliminary figures; land, water, and ice—orographic features and other geophysical agencies; the composition of the atmosphere; comparatitve meteorology—temperature; comparative meteorology—aqueous vapor; comparative meteorology—pressure and wind; changes in the general circulation—resilience or plasticity; transitory variations of pressure—cyclones and anticyclones; the structure of cyclonic depressions; and the earth's atmosphere. The last chapter presents certain assumptions, principles, and conclusions regarding the earth's atmosphere in the form of a series of 45 "articles" expressing atmospheric conditions between 4 and 8 km. and their relations with the air strata above and below. No positive conclusions are reached from a voluminous discussion of correlation coefficients, nor as to the relation of solar changes to sun-spot variations and their value for forecasting.

Climatological data for the United States by sections, [May–June, 1928] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 15 (1928), Nos. 5, pp. [196], pls. 3, figs. 2; 6, pp. [197], pls. 3, figs. 2*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for May and June, 1928.

Meteorological records (*Florida Sta. Rpt. 1927, pp. 109–114, figs. 2*).—Observations on temperature, pressure, precipitation, humidity, evaporation, wind, and cloudiness, as well as on soil temperature, water table, canal level, subsidence of the land, and other phenomena at the Everglades Experiment Station, Belle Glade, for the year ended June 30, 1927, are recorded and briefly discussed.

The mean temperature for the year was 72.73° F., the highest 97° June 16, 1927, the lowest 26° January 12, 1927. Killing frosts occurred December 31, January 2, 3, 11, and 12, and March 4. The total precipitation for the year was 57.72 in. Evaporation from a free-water surface was 64.9 in. The number of clear days was 171. While the curve for minimum temperature in summer indicates "nights that are entirely cool and comfortable, unfortunately it continues to fall and through January, February, and March temperatures are occasionally registered that pass below freezing." The rainfall was heaviest during the summer months It is stated that the average seasonal distribution of rainfall is similar to that of Cuba. A hurricane occurred September 18, 1926.

Meteorological observations at the Massachusetts Agricultural Experiment Station, C. I. Gunness, H. Baumgartner, and R. W. Nash (*Massachusetts Sta. Met. Buls. 473–476 (1928), pp. 4 each*).—The usual summaries of observations at Amherst, Mass., during May to August, 1928, inclusive, are given.

Rainfall in New England during the storm of November 3 and 4, 1927, X. H. Goodnough (*Jour. New England Water Works Assoc., 42 (1928), No. 2, pp. 150–187, pls. 4, figs. 26*).—From a study of data showing the amount, distribution, and intensity of the rainfall during this storm, which appears to have been general over the northeastern section of the country extending from Pennsylvania and New York across New England and into Canada, it is shown that "the precipitation was greatest and its results most destructive in Vermont, including adjacent sections of New Hampshire, and in western Massachusetts. At the same time there was a secondary storm which extended from central Massachusetts southerly from the neighborhood of Clinton and Marlborough down the Blackstone Valley and along the boundary line between Rhode Island and Connecticut to the sea near Westerly, R. I. The maximum precipitation in the northern storm was over 9 in. in southern Vermont, while in the smaller eastern storm an equal maximum precipitation occurred near the seashore at the Rhode Island-Connecticut boundary." The conditions of soil, contour, and the like, which favored a rapid run-off into the streams and thus increased the volume and destructiveness of the floods, are discussed. The data are presented in detail in tables, diagrams, and charts.

The weather-map story of the flooding rainstorm of New England and adjoining regions, November 3–4, 1927, J. H. Weber and C. F. Brooks (*Jour. New England Water Works Assoc., 42 (1928), No. 1, pp. 91–103, figs. 6*).—From a study of the development and movement of this storm, as shown by the four-hourly weather maps constructed from data received from the U. S. Weather Bureau and Canadian weather service stations and also from ships at sea, it is concluded that "the exceptional rains were due to a rare combination of a great quantity of humid tropical air pushed northward between two flows of polar air, and that the rain was precipitated chiefly where the warm, damp air was forced in large masses over a barrier of mountains backed by a higher barrier of cold air, or where forced to similar heights in a secondary low of small dimensions."

The New England flood, November, 1927, W. J. Backes et al. (*Bul. Amer. Ry. Engin. Assoc., 30 (1928), No. 308, pp. 1–105, pl. 1, figs. 77*).—This is a report of a special committee of the American Railway Engineering Association, dealing especially with the effect of the flood on "the railways of New England, eastern New York, and Canada, supplemented by data concerning the unusual rainstorm and conditions which caused the flood and the destruction which followed."

SOILS—FERTILIZERS

The relation of exchangeable cations to the physical properties of soils, L. D. BAVER (*Jour. Amer. Soc. Agron., 20 (1928), No. 9, pp. 921–941, figs. 7*).—Investigation was made in the work here reported from the Ohio Experiment Station of the effect of various cations on the moisture equivalent, the hygroscopic coefficient, the heat of wetting, the state of flocculation, the rate of slaking, and the plastic coefficients of a number of soils representing various soil textures, the effects observed being as follows:

The Ca ion produced no significant effect on the moisture equivalent, hygroscopic coefficient, and heat of wetting. It had a marked flocculating action on soils containing a high percentage of clay and a tendency to increase the plasticity number of the soil.

The K ion produced no significant change in the moisture equivalent value. It decreased the hygroscopic coefficient determined over 2 per cent and 30 per cent H_2SO_4, as well as the heat of wetting. It had a deflocculating effect on the soil suspension. It lowered the plasticity number of all the soils and both plastic limits.

The H ion showed no effect on the moisture equivalent, hygroscopic coefficient, and heat of wetting. It caused a decrease in the state of flocculation of the soil suspensions. In soils highly saturated with bases it decreased the plasticity number, but this was increased in soils with a low degree of saturation.

The Mg ion showed no marked effect on the moisture equivalent, hygroscopic coefficient, or heat of wetting. It decreased, with one exception, the state of flocculation. It had a tendency to increase the plasticity number.

The Mn ion produced no significant effect on the moisture equivalent, hygroscopic coefficient, and heat of wetting. It produced a strong flocculating action below the neutral point. There was a slight tendency toward an increase in the plasticity number.

The Na ion increased the moisture equivalent, due to the highly puddled condition of the soil. It decreased the hygroscopic coefficient as determined over 30 per cent H_2SO_4, as well as the heat of wetting, but it had no pronounced effect on the hygroscopic coefficient with 2 per cent acid. It caused a deflocculation of the soil suspensions. It increased the plasticity number of the soil by lowering the lower plastic limit.

Determination of the quantity and "quality" of colloids in soils, G. W. CONREY (*Jour. Amer. Soc. Agron., 20 (1928), No. 9, pp. 893–899*).—Discussion of this subject is centered upon the four questions, (1) Should methods of mechanical analysis be so modified as to include the determination of the quantity of soil colloids? (2) What methods are best adapted for the determination of the quantity of material in the colloidal state in soils? (3) Should one go further than the quantitative determination of the colloid content of soils? and (4 How can the qualitative nature or composition of the soil colloid best be determined?

As a result of the consideration of the 21 contributions on the subject taken up in the analysis here presented, it is concluded (1) that the quantitative determination of colloids in the mechanical analysis of soils is an important desideratum, the suggestion being made that such a determination could be substituted for that of the clay fraction; (2) that the adoption of 2 μ as the upper limit of size of particles to be classed as clay seems desirable for the sake of international conformity; (3) that "the chief weakness of mechanical analysis as ordinarily carried out is the lack of complete dispersion," reference being made to numerous recent methods designed to overcome this difficulty, with special emphasis upon the use of hydrogen peroxide; (4) that the ratio methods are apparently the best at present available for the quantitative determination of soil colloids, though the hydrometer method promises also to be very useful; (5) that the qualitative nature of the soil colloids is also important; and (6) that "since there is an interrelation between the various physical and chemical properties, the determination of one or two characteristics may serve to give an indication as to the quality of the soil colloid. The silica: iron and aluminum ratio seems to be especially suggestive. Further study is needed to determine just what determination will best serve to characterize the quality of the colloid."

Determination of the critical moisture content in the life of plants on black soil [trans. title], A. Maslova (Masslowa) (*Selsk. Khoz. Opytn. Delo (Landw. Versuchsw.) No. 10 (1927), pp. 3–16; Ger. abs., pp. 15, 16*).—The critical soil moisture content, defined as that degree of moisture at which the plants cease to increase in size, was determined at the Kharkof Agricultural Experiment Station by planting oats in culture jars and adjusting the moisture content after the plants had become well established. The point beyond which there was no further increase in growth is stated to have been ascertained by the direct weighing of air-dried cut plants. The critical moisture content thus determined was for the soil studied 11.5 to 12.5 per cent in 1925, and in 1926 13 per cent for soil not treated with fertilizers and for the treated soil 13.6 per cent. It is believed that the differences between the results of the two years are to be explained on the basis of differences in meteorological conditions.

Mechanical soil analysis and its application to the technique of Swiss agriculture, H. Schildknecht (*Die Mechanische Bodenanalyse und ihre Anwendung auf die Schweizerische Kulturtechnische Praxis. Diss., Eidg. Tech. Hochschule, Zurich, 1926, pp. 67, figs. 10*).—The thesis of this dissertation is that as a foundation for all agricultural soil improvement a thorough knowledge of the properties of the soil of the region to be improved is unconditionally necessary. The contents are as follows: Previous methods proposed, the relation of soil conditions to drainage distance, experimental material, mechanical soil analysis, the evaluation of the analytical results, a critique on previous methods, the practical application of the relation between drained distance and the constituents of the soil subject to washing, and a reference list of the literature.

Soil survey of the Sun River irrigation project, W. DeYoung (*Montana Sta. Bul. 207 (1927), pp. 48, pls. 6, figs. 3*).—The Sun River project is located in north-central Montana, includes parts of several counties, and comprises a total area of 148,720 acres, the total irrigable area being estimated as about 103,959 acres. The topography is that of the Great Plains, characterized by long, gently sloping plateaus with a number of high, isolated buttes south of Sun River. Irrigation is necessary to ensure dependable crops.

The soils of this region are grouped according to their origin, mode of formation, and topographic position into classes of (1) bench lands, (2) residual soils, (3) colluvial soils of mixed origin, (4) lake deposits, and (5) recent alluvium. The soils are further classified into 12 series, subdivided into 26 types, together with rough, gravelly land, coulee material, and river wash. The survey was made by the station in cooperation with the U. S. Bureau of Reclamation.

The chemical composition of the soils of the Trenton area in New Jersey, A. W. Blair and A. L. Prince (*New Jersey Stas. Bul. 462 (1928), pp. 14, figs. 3*).—From the Trenton area (E. S. R., 56, p. 416), 71 samples of soil, including 33 top soils, 37 subsoils, and 1 muck soil, representing 15 soil series, were analyzed, the determinations including nitrogen, phosphorus, phosphoric anhydride, potassium oxide, lime, magnesium oxide, total carbon, the pH value, and the lime requirement in pounds per acre.

For the most part no striking chemical differences were brought out. The heavier Collington types contained in general rather high percentages of phosphorus and potash, a finding attributed to the presence of greensand marl. Most of the Colts Neck and Keansburg soils also contained rather high percentages of phosphoric acid. The Lakewood, St. John's, Norfolk, and Leon series were almost invariably low in all plant food substances. The lime requirement was rather high in nearly all of the soils analyzed.

The residual sandstone and shale soils of Ohio, G. W. CONREY (*Ohio Sta. Bimo. Bul., 13 (1928), No. 5, pp. 181–190, figs. 7*).—In the three groups of the upland (residual) soils, the terrace soils, and the flood plain soils, the following series are descriptively treated: (1) Muskingum, Tilsit, Upshur, Brooke, Meigs, Westmoreland, Belmont, and Zanesville series; (2) the Wheeling, Holston, Monongahela, Tyler, Elk, Captina, Robertsville, and Vincent series; and (3) the Pope, Philo, Atkins, Huntington, Linside, Holly, and Moshannon.

The significance of soil variation in raspberry culture, M. B. HOFFMAN and G. R. SCHLUBATIS (*Michigan Sta. Spec. Bul. 177 (1928), pp. 20, figs. 8*).—A raspberry field comprising 2.5 acres was found to contain five distinct soil types and two subtypes. These soils were marked by differences in depth to the clay substratum, texture, content of organic matter of the surface soil, reaction, and average moisture content, as well as by decided differences in the height of the water level, marked variations in the last-named characteristic having been observed at points but 25 to 50 ft. apart. The soil types recognized are Napanee loam, Allendale fine sandy loam, a deep phase of the last-named, Newton fine sandy loam, Brookston loam, and Berrien loamy fine sand, detailed descriptions of which are given in an appendix.

Root penetration in these soil variants ranged from 10 or 11 in., with most of the roots at from 5 to 7 in. from the surface, to a maximum of from 30 to 35 in. with the roots more or less filling the soil to a depth of from 16 to 19 in. Both root development and root penetration were found closely correlated with the height of the water level, extensive and deep where the water level was low, but poor and shallow where prolonged high water level obtained, while top development, fruit yields, and longevity of the plants were directly proportional to the root development. No correlation of the soil acidity, soil nitrate concentration, or soluble soil salt concentration with plant growth in this field was observed.

The fundamentals of marsh land agriculture, O. HEUSER (*Grundriss der Moorkultur. Berlin: W. de Gruyter & Co., 1927, pp. VI+176, pl. 1, figs. 50*).—The cultivation of marsh land is treated in the present volume primarily from the viewpoint of the farmer rather than from that of primary emphasis on technical problems, considered by the author to be preponderantly the viewpoint of the previously available literature. Only such part of the scientific fundamentals of the study of marsh lands as is deemed essential to a comprehension of the agricultural practices set forth is treated in an introductory part, the second section, comprising about three-fourths of the text, being occupied with purely practical considerations.

Part 1, the development of marsh lands, contains chapters on the formation of meadows and marshes, on the classification and properties of marsh land soils, and on the distribution of marsh lands. Part 2, following a historical introduction, deals with draining, the preparation for tillage, special agricultural processes, farming on marsh land soils, meadows and pastures on marsh land soils, and the industrial economic relations and popular economic importance of marsh land agriculture.

Relation of climatic factors to the amount of nitrogen in soils, H. Jenny (*Jour. Amer. Soc. Agron., 20 (1928), No. 9, pp. 900–912, figs. 4*).—Noting that although many soil scientists are agreed that the distribution of the organic matter and nitrogen in the soil must be closely related to climatic conditions, this supposition is not based upon specific mathematical proof, the author of this contribution from the department of soils of the University of Missouri presents, on the basis of the assumption $N=f$ (climate), in which N represents the total nitrogen content of the soil, a theoretical equation for the climate-nitrogen content relation under conditions of constant humidity. He first resolves the "climate" term of the above equation into the two factors temperature and a humidity factor defined as the ratio of precipitation to evaporation, and thus obtaining the relation $N_H=f$ (temperature), in which the subscript limits N to conditions of constant humidity factor. From the last stated equation, considered in connection with the equation of the sigmoid curves commonly met with in biological processes,

$$A=\frac{}{1+Ce^{-kt}}$$

in which A represents the biological activity, t the temperature, and a and C constants, while e has its usual significance, the two relations,

$$n=\frac{a}{1+Ce^{-kt}} \text{ and } a-n=N_H=\frac{a}{1+C'e^{kt}}$$

where n represents nitrogen liberated (if the carbon: nitrogen ratio be narrow enough) from the soil, or "the nitrogen content of the soil decreases exponentially when the temperature increases, provided similar humidity factors are operative." Finally, by differentiating the two equations just stated and making certain substitutions it is shown that on the basis of the original assumption,

$$-\frac{\delta n}{\delta t}=\frac{\delta N_H}{\delta t}.$$

The experimental verification of the mathematical conclusions stated is given in two tables of calculated and observed soil nitrogen contents covering, in the semiarid regions, 15 observations at points varying in mean annual temperature from 0° to 22.22° C., and in the semihumid regions 18 observations with nearly as large a total temperature range.

It is stated in conclusion that "analysis of soil samples coming from a wide climatic range shows that the total nitrogen content of the soil decreases in the United States from north to south in relation to temperature. The change of the nitrogen content with temperature is a negative exponential function, provided the rainfall evaporation ratios are constant. For every 10° C. fall in mean annual temperature the average nitrogen content of the soil increases two to three times. . . . It seems to be possible to build up the nitrogen content of the soil by adding organic material in the North, because the low annual temperature would favor its preservation. In the South, however, it will be rather difficult if not impossible to increase permanently the nitrogen content by common green manuring practices, because the high temperature militates against nitrogen accumulation by favoring decomposition."

Desirable soil-nitrate levels for certain market-garden crops, J. B. SMITH (*Soil Sci., 26* (*1928*), *No. 4, pp. 265–279*).—In a brief review of work relating to this subject some observations are noted supporting the hypothesis that rather definite minima, possibly different for different types of plants, of soil nitrate concentration require to be maintained or exceeded for satisfactory growth. The results are presented of experiments at the Rhode Island Experiment Station on the relation of nitrate concentration, determined to the plowing depth of approximately 7 in., with the growth, in the 1/30-acre plats of Merrimac silt loam, of early cabbage, early tomatoes, lettuce, spinach, celery, and late beets. From 2 years' experiments the author concludes that the differences hypothesized are existent factors in crop growth, and, specifically, that the following levels of nitrate nitrogen concentration may be "designated tentatively as desirable to be maintained under the various crops throughout the growing season: (1) Golden Plume celery, lettuce, and late beets 10 parts per million; (2) Golden Acre cabbage 15 parts per million; and (3) early tomatoes and late spinach 20 parts per million.

"Nitrate accumulations from the oats, rye, and timothy green manures were correlated positively with the percentages of nitrogen in the crop decomposed, but the differences were obscured by the fertilizer nitrogen applied before a succeeding crop of celery. Oats green manure was increasingly detrimental to celery as the percentages of nitrogen in the oats crops compared were greater, but the injury could not be ascribed to the accumulation of nitrates from the decomposition of the crop."

The nutrition of farm crops, W. SCHNEIDEWIND (*Die Ernährung der Landwirtschaftl. Kulturpflanzen. Berlin: Paul Parey, 1928, 6 ed., rev., pp. VIII+543, pls. 15*).—The first edition of this publication has been noted (E. S R., 34, p. 326).

Soil fertility investigations, M. J. THOMPSON (*Minnesota Sta., Duluth Substa. Rpt. 1926–1927, pp. 29–40, 54, 55, fig. 1*).—Report is made of the progress of a number of fertilizer and rotation experiments, for the most part of the usual type, including (1) clover utilization, (2) rotation without clover or manure, (3) rate of manuring, (4) commercial fertilizers for potatoes and residual effect on clover and oats, and (5) garden fertilization. The results reported are in continuation of those previously noted (E. S. R., 55, p. 722).

Soil investigations (*Tennessee Sta. Rpt. 1927, pp. 6–8, 13, 14, 40–43, fig. 1*).—This continues previous investigations (E. S. R., 57, p. 615).

Though the western soils of west Tennessee do not respond well to phosphates, their phosphorus content is low, averaging only about 0.1 per cent. but a good response is given to liming. The soils of the eastern third of west Tennessee appear highly responsive to phosphate.

Most of the gray colored so-called "crawfishy" soil, not only of west Tennessee but also in scattered areas throughout the State, appears more deficient in potassium than do surrounding soils of a different character. Leaching is the tentative explanation of both color and poverty in nutrients as well as of the silty texture of these soils. General nutrient poverty was found not to be an invariable condition, however, phosphate requirement having been negligible at some points.

Progress reports of the fertilizer work at Crossville and Murfreesboro are included. Duplex basic phosphate proved especially well suited to the plateau soils.

Excessive caustic lime additions, with supplementary lime and sulfur treatment in the sulfur conservation work, have proved valuable in studies by W. H. MacIntire of the colloidal silica and aluminum content of the soil.

Experiments designed to show the effect of green manures upon calcium and magnesium losses from hydrated lime and from limestone and dolomite ground to various degrees of fineness have been begun. Potassium losses have also been determined, with results indicating that liming decreases the leaching out of potassium applied as fertilizer.

The preparation and storage of farmyard manure under Mauritius conditions, N. Craig (*Mauritius Dept. Agr., Gen. Ser. Bul. 38 (1927), Eng. ed., pp. 22*).—From this study of the farmyard manure supply under the tropical agricultural conditions of Mauritius, it is concluded that " whether the heap be covered or not is not important so long as care be taken not to lose the drainage. When the manure heap is loosely thrown together, the loss in the atmosphere is much greater than when the heap is well compacted. The addition of molasses to the manure heap causes greatly increased losses of nitrogen to the atmosphere, independent of the method of packing. The nitrogen in manure prepared with molasses is more readily available than in that prepared without it. The rate of fermentation is greatest when molasses is applied to the heap, and least when the manure is well compacted without molasses."

Soils studies, R. W. Ruprecht (*Florida Sta. Rpt. 1927, pp. 33, 34*).—In a study of the effect of various nitrogenous fertilizers on Norfolk and grass plats, ammonium sulfate and ammonium phosphate showed an increase in soil acidity even at the end of but six months of the experiment, while sodium nitrate applications showed a decrease in acidity.

The influence of various nitrogenous fertilizers on the availability of phosphate and potassium, J. F. Fudge (*Alabama Sta. Bul. 227 (1928), pp. 49*).—Soils of the long period fertility experimental plats not only of the Alabama Experiment Station, where the study was made, but also of the Rhode Island, New Jersey, Pennsylvania, and North Carolina Experiment Stations, were examined in the course of this somewhat extensive investigation of the effects of nitrogenous upon potassic and phosphatic fertilizers. Attack upon the problem was made principally through determinations of phosphate and potassium concentrations in the displaced soil solutions and in soil extracts, in the preparation of which water, 0.04 N carbon dioxide solutions, and 0.2 N nitric acid were used, and by means also of the Neubauer plant seedling method (E. S. R., 53. p. 319).

As a general conclusion drawn from this work, variations in the availability of potassium and of phosphate resulting from the use of various nitrogen fertilizers are deemed dependent upon two principal factors introduced by the nitrogenous fertilizers, (1) a modification of the reaction of the soil, and (2) the introduction of various cations. The acid-forming fertilizers, ammonium sulfate, ammonium nitrate, Leunasalpeter, and urea "caused an increase in water-soluble potassium. but this increase was at the expense of the potentially available supply, as indicated by Neubauer tests and nitric acid extracts." The acid-forming fertilizers also caused a marked decrease in the availability of phosphate. The physiologically basic nitrogenous fertilizers, sodium nitrate, calcium nitrate, and calcium cyanamide, caused an increase in phosphate availability. They also decreased the water-soluble potassium but tended to conserve the potentially available supply.

Individually, the effects of the various nitrogen sources investigated are reported as follows: Sodium nitrate increased phosphate availability, both the decrease in acidity and the introduction of the base sodium being considered effective in bringing about this result. Potassium concentrations in the displaced soil solutions and in water extracts were reduced, but the composition of the nitric acid extracts and the results of the Neubauer test indicated a concentration of the potentially available potassium. The sodium nitrate plats were relatively high in soluble calcium. Ammonium sulfate markedly decreased phosphate availability, impoverished the soil with respect to calcium, and made iron and aluminum effective in forming phosphatic salts. Soils receiving ammonium sulfate were found high in water-soluble potassium, made available at the expense of the potential supply. It is noted that leaching of potassium and its inefficient use when made abnormally soluble by ammonium sulfate will vary with a number of such factors as total potassium supply available, the nature of both surface and subsurface soils, rainfall, and plant growth. "It is possible that where there is a large supply of potentially available potassium and leaching is a minor factor, the use of ammonium sulfate will increase potassium availability to crops for a long period of time."

Calcium nitrate appeared to have about the same effect on the New Jersey soil, the only soil on which it was tested, as did sodium nitrate with respect to acidity and potassium solubility. Soluble phosphate was less on account of the formation of insoluble calcium phosphates.

With respect to potassium availability, calcium cyanamide behaved very much like calcium nitrate, but with respect to acidity it brought about a greater decrease than did any other source of nitrogen investigated. It caused a marked increase in phosphate availability in the Alabama soils, exceeding sodium nitrate in this effect, but upon the New Jersey soils it acted much as did calcium nitrate. Calcium cyanamide decreased water-soluble potassium but did not show a corresponding effect upon the nitric acid extracts and the Neubauer tests, the latter indicating "considerable increases due to the use of this fertilizer."

Dried blood increased acidity, but not nearly so much as did ammonium sulfate. In other respects the conclusions drawn are less definite than in the cases of the preceding sources of nitrogen.

Liming greatly decreased acidity and caused a marked increase in phosphate availability. The results with potassium were less consistent.

The concentration of phosphate and potash essential for plant growth in culture solutions, F. W. PARKER and W. H. PIERRE (*Alabama Sta. Rpt. 1927, p. 9*).—In a continuation of previous work (E. S. R., 59, p. 616), the maximum growth of corn was obtained at a concentration of 0.3 part per million of PO_4, but the growth at 0.1 was very satisfactory. It is concluded that the maximum growth of corn can be secured at very low concentrations of phosphate, though as yet good growth has not been secured in cultures at concentrations comparable with those in the soil solutions of some rather productive soils.

Maximum growth of corn and soy beans was secured in culture solutions of 7,500 cc. when the concentration of K was 2 parts per million.

The unavailability of phosphorus in rock phosphate to some southern crops, R. P. BARTHOLOMEW (*Jour. Amer. Soc. Agron., 20 (1928), No. 9, pp. 913–920, figs. 2*).—The experiments detailed in this contribution from the Arkansas Experiment Station consisted essentially in the growing in quartz cultures under treatment either with rock phosphate or with superphosphate (acid phosphate) of 11 crop plants common in the Southern States, together with determinations of the calcium and phosphorus contents of the plants grown, the last-named procedure being designed to bring out the relation, if any, between the composition of the plant and its feeding capacity with respect to rock phosphate.

Cotton, cowpeas, sorghum, serradella, beggarweed, lespedeza, bur clover, rice, and velvet beans made very little growth on the rock phosphate. Vetch made about one-third as much from rock phosphate as from superphosphate, and sweet clover about three-fourths. No definite relation between the calcium: phosphorus ratio in the substance of the plants and their ability to feed on rock phosphate was demonstrated. It is concluded that factors other than the calcium content play an important part in determining the ability of the plant to secure its phosphorus from rock phosphate.

The oxidation of sulphur in suspensions of activated sludge and its influence on the solubilization of mineral phosphates, C. V. R. Ayyar, T. S. S. Perumal, and R. V. Norris (*Jour. Indian Inst. Sci., 11A (1928), No. 8, pp. 85–90, pls. 3*).—In the series of experiments in which sulfur was added without a neutralizing agent the pH value dropped to 1.6, with a concomitant rapid production of titrable acidity. On adding mineral phosphate there was a still greater formation of acid, but this was used up in the solubilization of the phosphate and the pH value remained at about 4.6. In the absence of catalysts there was no corresponding increase in the water-soluble phosphate production when the sulfur oxidation increased, but in the presence of small quantities of sulfates of manganese, iron, and aluminum a rapid increase in phosphate solubility was noted. With the rapid oxidation of elementary sulfur there was an accumulation of water-soluble sulfate, and the amount of the sulfur oxidized in proportion to the mineral phosphate made soluble was found generally to be 4 of the sulfur to 1 part of mineral phosphate in the absence of catalysts, the introduction of the catalysts reducing the ratio to 1:1.

Testing fertilizers for Missouri farmers, 1927, L. D. Haigh (*Missouri Sta. Bul. 260 (1928), pp. 62, fig. 1*).—This is the usual annual report of fertilizer analyses for the year and includes suggestions for manufacturers of, dealers in, and purchasers of fertilizers and their component substances.

AGRICULTURAL BOTANY

Measurement of the biologically active ultra-violet rays of sunlight, L. Hill (*Roy. Soc. [London]. Proc., Ser. B, 102 (1927), No. B 715 pp. 119–128, pl. 1, figs. 5*).—Daily values of biologically active ultra-violet radiation, taken at many places during 1925, 1926, and part of 1927, show a great loss of this radiation in smoky cities, the winter readings being much lower than the summer readings.

Davos in Switzerland receives a greater amount of ultra-violet radiation than does the most favored British place, but is surpassed in this respect by Aswan (Assouan) in Egypt.

Relation of leaf structure of conifers to light and moisture, J. A. Larsen (*Ecology, 8 (1927), No. 3, pp. 371–377, pl. 1*).—It is stated that comparisons between the structures generally conceded to pertain to light do not show graded structural changes corresponding to gradations of tolerance. The extremes of the series show distinctive adaptations to light conditions as regards leaf shape and color, relative amount of leaf palisade parenchyma, relative amount of leaf spongy parenchyma, lignified leaf parts, and distinctive coloration.

Structures related to moisture requirement (most of these are related indirectly also to light intensity) show lack of differentiation in intermediate leaf forms and the same general conformation to expected differences in the extremes of the series. Characters in which the extremes show fairly consistent differences are general shape of the leaf, stomatal depression shape, stomatal location (in relation to grooves), nature of the parenchyma tissue, ratio of xylem to the entire leaf, amount of xylem to stoma, amount and condition of intercellular space, and the presence or absence of endodermis and the degree of its lignification.

The chemical nature of the middle lamella, W. M. HARLOW (*N. Y. State Col. Forestry, Syracuse Univ., Tech. Pub. 21 (1927), pp. 11*).—In this paper, intended to constitute the first of a series investigating the chemistry of cell walls in place, terms are defined, the related literature is reviewed and discussed, and a bibliography of 18 titles is given. Professedly, this paper seeks merely to harmonize a number of conflicting ideas as to the constitution of the middle lamella.

The decomposition of chlorophyll in the rinds of Satsuma oranges, W. A. GARDNER (*Alabama Sta. Rpt. 1927, p. 17*).—The author claims that 1 part of acetylene to 4,000 of air and 1 part of ethylene to 4,000 of air are far superior to motor exhaust for coloring oranges when the temperature is kept at 25° C., with high moisture. The cardinal temperatures for the chlorophyll-decomposing enzyme of Satsuma orange rinds were found to be: Minimum, below 13°; optimum, about 45°; and maximum, about 75°; with the thermal death point, 80°. Oxygen treatment is said to promote the destruction of chlorophyll in the rinds of Satsuma oranges, while the above-mentioned hydrocarbons in high and medium concentrations inhibit its decomposition. In high dilutions the hydrocarbons may stimulate the action of the decomposing enzyme. The juice of green untreated orange rinds was found to lack the enzyme frequently. It is claimed that the enzyme requires a substratum with a slightly acid reaction, since it does not function in solutions that are slightly alkaline.

Oxydo-reductions [trans. title], E. AUBEL and L. GENEVOIS (*Rev. Gén. Bot., 40 (1928), Nos. 469, pp. 53–62; 470, pp. 120–127, figs. 2; 471, pp. 184–189, fig. 1; 472, pp. 244–251*).—A somewhat general review, dealing largely with related literature, and accompanying a bibliography of 65 titles, is included, with an account particularizing in regard to potential of oxydo-reduction in plant cells, potential of oxydo-reduction and respiration, potential of oxydo-reduction and sexuality, and examples of biological oxydo-reductions.

Catalase and germination [trans. title], F. SCHMIEDER (*Mitt. Sächs. Forstl. Versuchsanst. Tharandt, 3 (1927), No. 2, pp. 65–96, figs. 4*).—During the process of germination, the catalase content of seeds passes through a grand period (according to curves shown), reaching a maximum and then declining steeply. The course of catalase is correlated with that of growth and is in relation to the factors concerned in germination. Particulars are given.

Symbiosis in higher plants [trans. title], J. MAGROU (*Rev. Gén. Bot., 40 (1928), Nos. 469, pp. 45–52, fig. 1; 470, pp. 111–119, figs. 4; 471, pp. 174–183, figs. 4; 472, pp. 252–256*).—The several topics dealt with in this account include a definition, with discussion, of symbiosis: ectotrophic and endotrophic mycorrhizas; characters of the mycorrhizal fungi; physiology of mycorrhizas; rôle of symbiosis in germination of seeds in the Orchidaceae; variations of activity of the fungi; immunity in symbiosis; the embryonic tubercles of Orchidaceae; physicochemical factors in tuberization; asymbiotic germination in Orchidaceae; the case of a potato, *Solanum maglia;* the theory of the protocorm and the origin of vascular plants; and symbiosis in the Hepaticae. The bibliography includes 45 titles.

Nodules in lupines [trans title], P. MILOVIDOV (*Rev. Gén. Bot., 40 (1928), No. 472, pp. 193–205, figs. 2*).—In connection with discussion of studies and with a bibliography of 16 titles, it is stated that infection of rootlets of lupines occurs, as in other legumes, through the agency of infectious filaments arising in the root hairs and extending themselves in the form of intercellular zoögloea. In lupines the nodosities arise in the layers of the pericambium. The formation of voluminous bacteroidal tissue results from the division of individual cells previously infected, with segregation of the bacteria in each into two parts, which are more or less [illegible] and which accumulate at the poles of the mitotic spindles in the shape of hoods. The mitotic figures in infected cells are perfectly normal.

Cells of bacteroidal tissue long retain the capability to divide by mitosis, despite the numerous living bacteria which they contain. Bacteria in nodosities of lupine apparently do not present a case of genuine parasitism. During their development in a nodule. the bacteria do not undergo any morphological modification. No branching forms were seen. In parts of old nodules of *Lupinus perennis*. which are in a condition of degenerescence, there may be found a network of intercellular zoogloea packed with young forms of bacteria. The mode of propagation of bacteria in lupine nodules is said to be of a type which is new and distinct from the two types previously known.

Wild legumes and soil fertility, E. Campbell (*Ecology, 8 (1927), No. 4, pp. 480–483*).—The percentage of wild legumes in the native vegetation of impoverished soils is comparatively high, decreasing proportionately in natural revegetation with the increase of total nitrogen in the soil. *Melilotus alba* is the leading revegetation legume in the Middle Western States, while *Lespedeza striata* and other species of Lespedeza lead in the Southern States. The genus Lespedeza seems to be acid tolerant. The kinds and percentage of native legumes in any wild association of plants are an index of ecological conditions.

A summary of the soil fungi, J. C. Gilman and E. V. Abbott (*Iowa State Col. Jour. Sci., 1 (1927), No. 3. pp. 225–343, figs. 83*).—"The key to soil fungi presented here is the outgrowth of a study of the fungus flora of soils which has extended over a period of nearly five years. During the course of the work several hundred isolations were made from soils in Iowa and Louisiana, while a less systematic study was made of soils from other sources as opportunity arose. The key is intended to include all of the species of fungi which are reported in the literature as having been isolated from the soil, in addition to those which are reported for the first time by the authors. Certain exceptions are noted under the different genera. . . .

"Wherever possible the key has been based on the existing keys to the various genera and species, making such changes as were necessary to include the soil forms and the new species described. . . .

"The term 'soil' is not defined. . . . Only such forms as have been directly isolated on an artificial cultural medium are included."

Two hundred and forty-two species of fungi in 61 genera obtained from the soil are described. Of these 20 are indicated as new. Twenty-six of the species have not previously been reported from the soil, and 58 are reported from new localities.

Food plants, D. Bois (*Les Plantes Alimentaires. Paris: Paul Lechevalier, 1927, pp. 593. figs. 255*).—In this book, the first volume of the Encyclopédie Biologique, the author deals with food plants over a wide range as regards their history. utilization, culture, etc.

Medicinal plants of France (*Nos Plantes Médicinales de France. Paris: Com. Intermin. Plantes Med.. Off. Natl. Matieres Premières [1928], pls. 8*).—Illustrations in colors, popular descriptions, cultural directions, and uses are given of the following plants that are recognized to have medicinal value: *Melissa officinalis, Datura stramonium, Althaea officinalis, Citrus vulgaris, Aesculus hippocastanum, Lappa major, Lavandula officinalis*, and *Evernia prunastri* and *E. furfuracea*. The present issue is part 7 of a series.

Plant material introduced by the Office of Foreign Plant Introduction, Bureau of Plant Industry, from October 1 to December 31, 1925 (*U. S. Dept. Agr., Inventory 85 (1928), pp. 32*).—Descriptive notes are given of more than 600 lots of seeds and plants introduced for testing, a large portion of the introductions having been secured by P. H. Dorsett in Manchuria.

GENETICS

The interaction of genes in development, C. H. DANFORTH (*Soc. Expt. Biol. and Med. Proc., 24 (1926), No. 1, pp. 69–71*).—Evidence is presented from the action of the yellow gene in mice—which is lethal when homozygous and a single dominant causes yellow coat color and adiposity—in its relation to the genes for color and spotting, to indicate that the genes do not interact in the beginning to produce a definite type of protoplasm but that they behave as separate dynamic factors in development.

Studies in Prunus, I, II, C. D. DARLINGTON (*Jour. Genetics, 19 (1928), No. 2, pp. 213–256, pls. 8, figs. 25*).—A detailed report of studies at the John Innes Horticultural Institution, England, upon the somatic chromosome constitution and chromosome behavior in a number of species of cherries.

Somatic chromosome number determined in the flower buds of grafted varieties and in the root tips of seedlings indicated that 8 is the basic number for Prunus. Sour and Duke cherries were tetraploid and sweet cherries approximately diploid.

Discussing the probable origin of cherries, it is suggested that *P. avium* is the older stock and that it is not impossible that *P. cerasus* resulted from hybridization of *P. avium* and a tetraploid species, possibly *P. fruticosa*. Irregularities were noted in the chromosome behavior of every sweet cherry examined. Duke cherries, commonly believed to be hybrids between sweet and sour forms, are thought to have arisen as aberrant doubled segregates from diploid gametes of sweet cherries. All of the edible varieties of sweet cherry were aneuploid, having 1, 2, or 3 chromosomes beyond the diploid number. These extra chromosomes are thought to have great value in determining characters for which the genetic basis is lacking in the diploid. The occurrence of incompatible groups of self-sterile sweet cherries may be due in part to the close family relationship which must exist between them, since practically all sweet cherry varieties trace their origin directly to the garden or orchard.

Canna crosses.—II. The chromosome numbers of Canna glauca, C. glauca × indica F_1, C. aureo-vittata, and C. aureo-vittata gigas, J. A. HONING (*Meded. Landbouwhoogesch. Wageningen, 32 (1928), No. 4, pp. 14, figs. 51*).—The haploid chromosome count in *C. glauca* and in *C. aureo-vittata* was found to be 9. Univalent chromosomes were observed in diakinesis in a hybrid between *C. glauca* and *C. indica*. Gigas forms were noted in 7 out of 4,399 *C. aureo-vittata* individuals.

Cytological and genetic studies on Fragaria, K. ICHIJIMA (*Genetics, 11 (1926), No. 6, pp. 590–604, figs. 30*).—Studies at Harvard University involving 11 species and 12 cultivated varieties indicated that the basic chromosome number in Fragaria is 7, and suggest the possibility of grouping species according to the chromosome count. The so-called European type with 7 haploid chromosomes contains *F. vesca*, *F. americana*, *F. californica*, *F. mexicana*, *F. helleri*, and *F. bracteata*; the Haut-bois type with 21 haploid chromosomes is represented by *F. elatior*; the American type with 28 haploid chromosomes by *F. virginiana* and *F. glauca*; the Chilean type with 28 haploid chromosomes by *F. chiloensis* and *F. cuneifolia*; and the cultivated variety type with 28 haploid chromosomes by William Belt, Chesapeake, and other commercial varieties.

With 7 as the basic haploid number, Fragaria was evidently represented by diploid, tetraploid, hexaploid, and octoploid species. *Duchesnea indica*, with 42 haploid chromosomes and capable of crossing with *F. vesca*, may be considered as a dodecaploid species. The European type with 7 gametic chromosomes is considered the primitive form, a hypothesis further confirmed by the plants and their hermaphroditic flowers. No wild species was found with 14 haploid chromosomes, but a tetraploid form was obtained in a *F. bracteata*×*F. helleri* cross. The results corroborate those of Longley (E. S. R., 55, p. 130).

Cytological studies in the genus Nicotiana, M. Christoff (*Genetics, 13 (1928), No. 3, pp. 233–277, figs. 69*).—Cytological studies at the Bussey Institution with species of Nicotiana showed the haploid numbers in *N. tabacum*, *N. rustica*, *N. bigelovii*, *N. viscosa*, *N. nudicaulis*, *N. quadrivalvis*, and *N. multivalvis* to be 24, in *N. suaveolens* 16, in *N. paniculata*, *N. glutinosa*, *N. glauca*, *N. sylvestris*, *N. tomentosa*, *N. acuminata*, *N. trigonophylla*, and *N. caudigera* 12, in *N. longiflora* and *N. plumbaginifolia* 10, and in *N. alata* and *N. langsdorffii* 8.

Crosses among 15 species showed four degrees of compatibility between the species. It was found further that species with 8 haploid chromosome numbers produced fertile hybrids as did species with 10, while the ability to hybridize was very low between species with 12, although less difficult between species with 24 chromosomes. Morphological descriptions of species hybrids obtained are given, with comments on the reduction division in the pollen mother cells in nine species hybrids. The hybrids which reached maturity were completely sterile, with one exception. Nonviability of the gametes seemed to parallel irregular reduction division.

The compatibility of the species appeared to show greater relation to the chromosome number than to the taxonomic status, although possession of the same chromosome numbers by two species does not mean that they will cross. In general a cross can be made more easily when the species with the higher chromosome number is used as the female parent. There seemed to be no particular correlation between the vigor of the hybrid and the mode of the reduction, except that in cases where the reduction division is normal the plants are never weak. Although the Nicotiana species probably did not originate by multiplication of 4 chromosomes, it is held possible that they did originate from one or more 8-chromosome species by a reduplication of certain chromosomes or of whole sets of chromosomes.

Contribution to the genetical investigation of inheritance of the number of leaves and other characters with Nicotiana tabacum [trans. title], S. B. Davidovich (Dawidowicz) (*Trudy Detskoselsk. Akklim. Sta. Leningrad. Selsk. Khoz. Inst.* (*Bul. Sta. Acclim. Leningrad Agr. Inst., Detskoje Selo*), *No. 7 (1928), pp. 7–38, figs. 3; Eng. abs., pp. 35–38*).—The inheritance of length, width, and numbers of leaves, plant height, and time of blooming were studied in the progenies of hybrids between varieties of *N. tabacum* with many and few leaves, respectively, and differing in other quantitative characters.

Each quantitative character in F_1 and F_2 seemed to be characterized by a series of continuous gradations in size, the variation being the greater in F_2. The average values for these characters in different progenies tended to lie between the parental averages. This was particularly noticeable with number of leaves, which seemed to be the character least affected by soil conditions. Number of leaves appeared to be correlated with earliness but with no other character. The author concludes that the characters studied are all dependent on several distinct factors which are equally effective.

A genetical investigation concerning the formation of the bases of the tobacco leaf [trans. title], Ю. A. Burtsev (G. A. Bourzev) (*Trudy Detskoselsk. Akklim. Sta. Leningrad. Selsk. Khoz. Inst.* (*Bul. Sta. Acclim. Leningrad Agr.*

Inst., Detskoje Selo), No. 7 (1928), pp. 47–115, figs. 59; Eng. abs., pp. 88–93).—A preliminary report given on a study of the genetic structure of leaf bases in selections from tobacco hybrids indicates tentatively the factorial composition of a number of basal forms.

Some hybrids of varieties of white clover (Trifolium repens L.), A. G. Erith (*Jour. Genetics, 19 (1928), No. 3, pp. 351–355*).—F_1 hybrids of crosses between several varieties and races of white clover showed no correlation between leaf color and cyanophorism in any of the hybrid plants. A single factor difference was indicated between pink and white flowered plants, with pink dominant.

Some observations on mutations in deciduous fruits, B. D. Drain (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 147, 148*).—Attention is directed to various mutations which have been observed by the author in the cherry, plum, peach, and apple and which suggest by their frequency that mutations are not so rare as commonly believed.

Mutations in barley induced by X-rays and radium, L. J. Stadler (*Science, 68 (1928), No. 1756, pp. 186, 187*).—Germinating seeds of barley treated with X-rays at the University of Missouri gave rise to a number of mutations, largely seedling characters of chlorophyll defects. The treatments had been so given that the somatic mutations induced affected the progeny of only part of the plant. Soaking the seeds in m/5 solutions of barium nitrate, lead nitrate, and uranyl nitrate appeared to increase the effectiveness of irradiation. White and virescent mutations were also induced by radium treatment. The 48 mutations causing distinct seedling characters found following irradiation include almost all the seedling characters of barley previously reported and several not described before. No mutations were found in untreated plants, of which about 1,500 head progenies were examined.

The inheritance of pod characters in the bean [trans. title], S. Wóycicki (*Acta Soc. Bot. Polon., 5 (1927), No. 1, pp. 20–51, figs. 6; Ger. abs., pp. 48–51*).—Studies of the F_2, F_3, and F_4 generations of crosses between bean varieties differing widely in the forms of their pods led to the conclusion that length, breadth, and thickness are dependent upon multiple factors. That these factors are separate entities and are able to combine in various ways was evident in the diverse forms of pods in the several generations. In the F_2 generation of the Królowa×Japońska cross the coefficient of correlation between length and breadth of pods was 0.470±0.08, between breadth and thickness 0.072±0.11, between waviness and flatness 0.223±0.05, and between pod length and the number of seeds 0.773±0.07. It is assumed that linkage exists between the factors governing pod length and pod breadth.

The disturbing effect of the glutinous gene in rice on a Mendelian ratio, L. F. Chao (*Genetics, 13 (1928), No. 3, pp. 191–225, fig. 1*).—Studies at the Wisconsin Experiment Station of hybrids between glutinous and nonglutinous rices indicated that the nonglutinous factor is a Mendelian dominant to nonglutinous and due to a single factor pair, *Gl gl*. A significant deficiency of the recessive type appeared to be the result of self-pollinating heterozygous plants. The cause of the deficiency is probably to be sought during the development of the male gametophyte, particularly during the vegetative growth of the pollen tube. The primary cause of the differential pollen tube development occasioning the distorted nonglutinous and glutinous ratio is attributed to influences inherent to the glutinous gene. Experimental evidence submitted indicates that pollen tubes carrying the glutinous gene and growing slower under ordinary conditions may grow faster under particularly favorable conditions, such as temperature and humidity, producing an excess of recessives.

Further evidence on the factor for bitterness in the sweet almond, M. J. HEPPNER (*Genetics, 11 (1926), No. 6, pp. 605, 606*).—Records taken on the total of 723 almond trees resulting from the crossing of various commercial varieties showed a total of 547 sweet and 176 bitter fruited trees, a proportion of 3.108:1, very closely approximating the expected Mendelian 3:1. With the exception of two crosses in which the variety Harriott appeared and which yielded all sweet nuts, the results strongly indicated that practically all almonds are heterozygous for sweetness as the dominant character and bitterness as the recessive character.

The occurrence of nose spots and tail spots in guinea pigs, O. N. EATON (*Jour. Agr. Research [U. S.], 37 (1928), No. 1, pp. 25–41, figs. 6*).—A study of the occurrence of nose and tail spots among the inbred families of guinea pigs in the Beltsville colony of the Bureau of Animal Industry, U. S. D. A., showed that family 2, which produced a considerable number of nose- and tail-spot individuals, could be divided into two lines in the eighth and ninth generations, the one producing 14.4 per cent of nose-spot and 2.81 per cent of tail-spot animals, while the other line produced 3.31 per cent of nose-spot and 9.93 per cent of tail-spot animals. The other inbred families, as a whole, produced 1.01 per cent of nose-spot individuals and 1.63 per cent of individuals having tail spots.

In a selection experiment for the production of nose spot, the percentage of nose-spot individuals was only 14.20, which was similar to the amount found in the particular line showing a high percentage of this characteristic. There was very little or no relation between the occurrence of the nose-spot and tail-spot characteristics to birth weight, size of litter, mortality, season of birth, sex, or litter rank in which the pigs were born, though the nose-spot animals showed slightly more white, this being accounted for by the presence of the spot itself. The line showing high percentages of nose and tail spots also showed an excess of red spots on the right shoulder and left hip in about the same proportions as red was in excess of black in the whole coat area of the animals. The nose, however, showed a greater tendency to be red if colored at all.

It was concluded that with the presence of the factors for the tricolor pattern the location of the spots appears to be determined by local conditions, with a slight hereditary tendency of colors to develop at specific locations in particular lines.

Wool covering on face, ears, and legs, E. G. RITZMAN (*New Hampshire Sta. Tech. Bul. 37 (1928), pp. 35, pls. 4, figs. 3*).—The results of a study of the inheritance of wool covering on the face, ears, and legs of sheep, made by crossing Southdowns, Hampshires, Oxfords, and Dorsets with Rambouillets, indicated no simple dominance for heavy or light covering of wool on these parts. There was marked variability in the wooling of the F_1 offspring in the different crosses, which indicated heterozygosity in the parent breeds. There was a general tendency for the F_2s to show a greater variability, but with less wool covering than on the F_1s. There was a still further regression in the degree of wooling of the head in the F_3s, which was explained as due to the failure in the selection of F_2 sires with a heavy covering of the face, ears, and legs.

It is concluded that the wool covering of the face, ears, and legs was subject to several groups of complex factors independent of each other. A correlation between the diameter of the fiber and the degree of wool covering on the face indicated that the diameter of the fiber of animals having fleece over the face was usually less than 27 to 30 μ.

A study of the implantation of the ovum of the pig from the stage of the bilaminar blastocyst to the completion of the fetal membranes, C. H.

Heuser (*Carnegie Inst. Wash. Pub. 380 (1927), pp. 229–243, pls. 5, figs. 6*).—A detailed account of implantation of the pig embryo up until the time when the formation of the fetal membranes is completed.

The menstrual cycle of the monkey, Macacus rhesus: Observations on normal animals, the effects of removal of the ovaries and the effects of injections of ovarian and placental extracts into the spayed animals, E. Allen (*Carnegie Inst. Wash. Pub. 380 (1927), pp. 1–44, pls. 13, fig. 1*).—A complete account of experiments for which preliminary reports have been noted from several sources (E. S. R., 56, p. 819).

The effect of maternal age and of temperature change in secondary nondisjunction, R. R. Huestis (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 55 (1928), No. 2, pp. 121–134, figs. 2*).—In studies of the effect of maternal age and temperature on secondary nondisjunction in Drosophila, it was found that the percentage of exceptions to sex linkage was affected by a number of variables in the following order of importance: The genetic constitution of the female, the temperature at which the eggs were ripened, and the maternal age.

Females of the XX constitution produced less than 1 per cent of primary exceptions, while females of the XXY constitution produced from 1 to over 20 per cent of exceptions. The effect of temperature appeared to be direct, and the data suggested that the temperature effect increased as 30° C. was approached, though this relation was possibly due to genetic differences in the groups of females. The influence of maternal age on the percentage of exceptional young appeared to be the result of interaction with other variables.

Is the Manoilov reaction a better test for metabolic level than for sex? O. Riddle and W. H. Reinhart (*Soc. Expt. Biol. and Med. Proc., 24 (1927), No. 4, pp. 359–362*).—Manoilov tests conducted on male and female pigeons have shown correct identification of the sex in about 85 per cent of the cases when the birds were in the resting stage, but the test is not nearly as accurate for birds during egg laying and incubation. The Manoilov test is concluded to be a more accurate indicator of metabolic level than of sex.

Sex sterility and the diminutive copulatory organ in the domestic fowl, W. F. Dove (*Science, 68 (1928), No. 1762, pp. 327, 328*).—A lack of the diminutive copulatory organ in White Leghorn males was found to result in sterility or very low fertility in three of the four individuals of this character observed at the Maine Experiment Station. It was also found possible to separate the sexes with an accuracy of 75.6 per cent at 2 weeks of age and 81.7 per cent at 4 weeks of age by this characteristic. The error is due to the lack of the gland in some males and its presence in some females.

FIELD CROPS

[Agronomic investigations in Alabama], J. T. Williamson, W. H. Appleton, M. J. Funchess, J. M. Robinson, W. W. Pate, H. B. Tisdale, W. A. Gardner, J. F. Duggar, R. W. Taylor, and C. L. Isbell (*Alabama Sta. Rpt. 1927, pp. 5–9, 16, 17, 25, 26, 30*).—Cooperative fertilizer tests during 4 years showed nitrogen to be the element most needed for cotton on the Decatur, De Kalb, Cecil, Norfolk, Kalmia, Orangeburg, and Greenville soils and phosphorus on the Clarkesville and Oktibbeha soils. For cotton following legumes the most profitable fertilizer was superphosphate (acid phosphate) 600 lbs. and potassium chloride 75 lbs. When a satisfactory growth of legume preceded, cotton did not respond to sodium nitrate, whereas 100 lbs. gave a profitable yield increase if the legume made poor growth.

Cotton yields in 1925 were similar from sodium nitrate and ammonium sulfate applications on both limed and unlimed plats and in 1926 on limed plats. The yield depression on the 1926 unlimed ammonium sulfate plat seemed due to acidity. Profitable yield increases followed increase in fertilization up to 1,500 lbs. per acre on cotton both dusted with calcium arsenate for boll weevil and undusted. The increase from dusting rose with the fertilizer rate up to about 1.000 lbs. of fertilizer and but little thereafter, indicating that poisoning for weevil control is unprofitable unless other conditions favor production of a good crop. Stable manure, sodium nitrate, and vetch as nitrogen sources were similar in increasing the yields of cotton and corn. Where cotton received sodium nitrate at the acre rate of 300 lbs. at planting and 39 and 56 days after, analysis of plants taken at intervals during growth showed that with application at planting very little nitrate was absorbed by the cotton during the next 60 days. Absorption was rapid with application 39 days after planting, as much nitrate being taken up in 36 days as in 84 days when applied at planting. The absorption of 75 lbs. of nitrate applied at planting required 83 days, applied 39 days after planting 36 days, and 56 days after planting 27 days.

The best cotton yields with both high and low fertilization have been made when spaced 24 in. in the row and 2 plants per hill. Practically the same yield was made on almost all plats carrying from 10,000 to 35,000 plants per acre.

Monantha vetch sown September 30 produced more dry matter and pounds of nitrogen per acre than that planted at three later dates, regardless of the cutting dates. Delay in planting resulted in smaller crops. The yield increases from delayed cutting were not so great as the decreases from late planting. The results of turning under vetch at different times for cotton and corn have been noted (E. S. R., 59, p. 437).

Most of the commonly grown vetches and winter peas developed one or more nodules within from 6 to 9 days when planted about October 1, and when planted November 1 to 7, in 11 to 21 days. When planted early in December from 22 to 31 days elapsed between emergence and tubercle formation in most species, but when planted the last week of February tubercle formation was almost as rapid as in October plantings. With delay in planting, in nearly every legume total growth decreased, plants reached the grazing, green manure, or hay stages later, and the period between emergence and blooming was shortened. Plants from pod-covered seeds of both crimson and bur clover were inoculated quicker and better than those from dehulled seed after treatment in inoculating solution, whereas inoculation was similar for both with seed planted untreated. Deficiency of available phosphorus, weedy grasses, leaf eating caterpillars, and fungus diseases all seemed to hinder the growth of alfalfa.

Changes in the percentages of moisture and carbohydrates in sweet potatoes were found closely associated with changes in soil moisture as influenced by weather conditions. Sweet potatoes left undisturbed in the soil until frost tended to gain in moisture percentage and to lose in percentage of starch.

Potato experiments in Escambia County showed potassium sulfate in complete fertilizer to surpass the chloride as to yield, and cottonseed meal followed by ammonium sulfate to lead the nitrogen sources.

[Field crops investigations in Florida], W. E. STOKES, R. W. RUPRECHT, A. F. CAMP, J. H. JEFFERIES, and G. E. TEDDER (*Florida Sta. Rpt. 1927, pp. 17–26, 37, 39, 40, 56–58, 96, 97, 117–119, figs. 2*).—Agronomic experiments (E. S. R., 56, p. 821) reported on from the station and substations included variety tests with corn, sorghum, and miscellaneous grasses and legumes; trials of winter legumes, cover crops, green manure crops, and lawn and pasture grasses; fertilizer tests with peanuts and potatoes; an irrigation trial with Napier grass; a mulching test with potatoes; and breeding work with cotton.

Of the winter cover crops hairy and Monantha vetch made the most satisfactory growth and were early enough to permit preparation for other crops. Certain other legumes grew well on Norfolk sandy soil highly fertilized and irrigated, but such treatments did not seem practical. Hairy vetch thrived on a number of soils, except dry, sandy soil. Fertilizer treatments did not increase peanut yields on Norfolk sand, and ground limestone even depressed the yields of peanuts, as well as of corn and velvet beans, grown in the same rotation.

Crotalaria striata roots grew deeply on Norfolk sandy soil, attaining the extreme depth of 9 ft. 6 in., while on flatwood soil they penetrated to hardpan and then spread laterally. It led the cover crops at the Citrus Substation and yielded more hay than cowpeas, beggarweed, or velvet beans on Norfolk sandy soil In green manure studies with *C. striata* under greenhouse conditions, plants in early growth stages were relatively high in percentages of easily hydrolyzable carbohydrates, exceptionally high in total nitrogen and soluble nitrogen, and relatively low in cellulose and lignin. After a period of rapid vegetative growth there was a 50 per cent decrease of easily hydrolyzable carbohydrates and a marked increase in the percentage of cellulose and lignin. However, during flowering and seed formation easily hydrolyzable carbohydrates again became normal. Lignin remained rather constant from then on, while cellulose increased gradually. The percentages of total and soluble nitrogen gradually decreased during the later growth stages. All compounds increased in quantity, and the percentage of dry matter in the plants rose with the advance in plant growth and weight.

Centipede grass and St. Augustine grasses continued to lead the lawn grasses. Bermuda grass lawns and putting greens were kept green throughout the year by watering as needed, applying ammonium sulfate or prosphate every 2 weeks (totaling 1,000 lbs. per acre per year), and mowing daily during summer and about three times a week during winter. Two years' use of these salts has not checked weed growth in comparison with sodium nitrate. Manila, St. Augustine, Dallis, Para, Carib, and Napier grasses, *Panicum aquaticum*, *P. altum*, and *Echinochloa crus-galli* grew well after submergence for 25 days at the Everglades Substation.

Analyses by W. A. Leukel on Bahia and carpet grasses from an established sod showed plants in ungrazed areas to be higher in percentage of easily hydrolyzable carbohydrates and lower in total nitrogen; i. e., showing a wider carbohydrate-nitrogen relation than grazed plants. Ungrazed plants produced rather upright growth and abundant seed, while grazed plants gave more vegetative top growth, fewer seed stems, and were more prostrate, forming a denser sod. Similar observations were made on transplanted Bahia grass uncut and top-cut at short intervals.

The green weights of crowns, roots, and tops of Napier grass plants from equal areas irrigated with sewage were over twice as great as those from like areas irrigated with city water or unirrigated. Sewage irrigated plants also were outstanding in dry weights of crowns, roots, and tops, and their crowns were higher in percentages of dry matter and all forms of easily hydrolyzable carbohydrates and total nitrogen. The comparative showing made by the sewage-irrigated plants appeared to indicate the significance of proper fertilization of certain forage plants during their first years of growth.

Yields of potatoes planted at weekly intervals between January 10 and February 14, inclusive, and mulched with hay and weeds or not mulched, together with soil temperature and moisture determinations, indicated to M. R. Ensign that temperature is the chief climatic factor influencing yields, moisture being secondary and showing its chief effects in soil-temperature modification and influencing the amount of Rhizoctonia infection. Soil moisture content was the controlling factor of Rhizoctonia infection below 20° C. (68° F.) and temperature above that point. Temperatures during the period of tuber growth showed a high positive correlation with the average weight of tubers produced in the successive plantings, the highest yields being made at about 17°. Mean temperatures for the growing period of January to May 15, over 13 years, indicate that potatoes planted January 1 to 15 in the La Crosse area are most likely to develop under favorable temperatures. Mulch reduced soil temperatures from 3 to 5° at a depth of 8.9 cm. (3.5 in.), and this seemed responsible for an increase in size and a decrease in number of potatoes per hill, resulting in more marketable tubers. The average green weight of tops per hill was the greater in unmulched rows. The lower content of soil moisture in the mulched area indicated a higher rate of transpiration from plants therein.

[Field crops work at the Georgia Coastal Plain Station, 1927], S. H. STARR (*Georgia Coastal Plain Sta. Bul. 9 (1928), pp. 8–20, 22–38, 46–48, 60–62*).—Agronomic experiments reported embraced variety tests with wheat, oats, rye, corn, cotton, peanuts, soy beans, millet, velvet beans, winter field peas, vetch, bur clover, miscellaneous legumes, potatoes, sweet potatoes, and tobacco; fertilizer trials with oats, cotton, corn, peanuts, potatoes, sweet potatoes, and tobacco; liming and green manure tests with oats, cotton, and corn; cultural (including planting and harvesting) tests with wheat, oats, cotton, peanuts, potatoes, and sweet potatoes; lowland pasture studies; and storage trials with sweet potatoes. The leading crop varieties and conclusions and recommendations from the investigations listed above were usually those indicated in the previous report (E. S. R., 58, p. 732).

[Field crops work at the Duluth, Minn., Substation, 1926 and 1927], M. J. THOMPSON (*Minnesota Sta., Duluth Substa. Rpt. 1926–1927, pp. 5–25, 49–53, 55, 56, figs. 5*).—Continued experiments (E. S. R., 55, p. 734) reported on for the years indicated comprised variety tests with spring wheat, oats, barley, rye, alfalfa, potatoes, rutabagas, mangels, turnips, and carrots; cultural (including seeding) tests with oats, barley, potatoes, alfalfa, sweet clover, and sunflowers; trials of rye, oats, and barley for cereal hay; storage, spraying, and fertilizer tests with potatoes; trials of nurse crops for sweet clover; production of clover silage, involving the woven wire cage; comparisons of meadow mixtures and of methods of renovating meadowland; and studies of crop rotations and crop sequences.

Field crops for pump irrigation at Harney Branch Experiment Station, 1920 to 1927, O. SHATTUCK and R. E. HUTCHISON (*Oregon Sta. Bul. 236 (1928), pp. 30, figs. 7*).—Variety, fertilizer, and duty of water experiments are reported for the period 1920–1927, with suggestions for pump irrigators in the Harney Valley and meteorological data.

Leaders among the crop varieties included Federation spring wheat, Turkey and Hybrid 128 winter wheat, Swedish Select, Golden Rain, Early Mountain, and Idamine oats (in recent tests Markton, Three Grain, and Western Wonder oats), Trebi and Hannchen barley, Grimm alfalfa, Kaiser field peas, and Early Ohio potatoes. Seeding methods and rates are indicated for these crops and for peas in combinations with oats, wheat, and barley.

Duty of water tests indicated 12 acre-in. for wheat and for alfalfa, and the highest acre yields of field peas were made with 18 in. and of potatoes with 14 in. In fertilizer trials manure demonstrated its value as a fertilizer for wheat and sunflowers, and field peas made slight gains with manure and manure plus superphosphate (acid phosphate), whereas results with alfalfa were rather inconclusive.

[Field crops work in Tennessee], C. A. Mooers and L. S. Mayer (*Tennessee Sta. Rpt. 1927, pp. 12, 13, 30, 31*).—Experiments in cooperation with the U. S Department of Agriculture at Clarksville showed sodium nitrate and ammonium nitrate to lead the nitrogen sources for tobacco. Magnesium chloride and sulfate were unprofitable, although apparently increasing yields. Average yields rose with increase of the potash from 0 to 6 per cent in the complete fertilizer. An 8–4–4 fertilizer mixture yielded and paid better than an 8–2–2, and 400 lbs. of the 8–4–4 was more profitable than 200 or 800 lbs. The yield and quality of tobacco after bare fallow surpassed those after winter cover crops of cereals. Tobacco did better after clover and sweet clover than after annual legumes and better on limed than on unlimed land. Plants spaced 3.5 by 3.5 ft. produced more than at wider spacings.

A brief account of the progress of cooperative corn improvement work is given by Mayer.

[Agronomic studies in England] (*Jour. Natl. Inst. Agr. Bot., 2 (1928), No. 1, pp. 4–55*).—Experiments reported in these pages include trials of new early (1927) and of main crop potatoes (1925–26) reported by W. H. Parker, and tests of winter wheat and spring barley (1925–26) by S. F. Armstrong. A report by A. E. Humphries, J. P. Clover, and R. Hutchinson discusses the quality of wheats from the above trials. Reports are also given of the Lord Derby Gold Medal potato trials, and of the Potato Synonym Committee, both for 1927.

Experiments with small grains in southern Arizona, I. A. Briggs and R. S. Hawkins (*Arizona Sta. Bul. 126 (1928), pp. 249–273, figs. 7*).—Varietal leaders among the small grains included Early Baart wheat, common 6-row barley, and Texas Red oats. The yields of rye, spelt, and emmer were unsatisfactory. Early Baart gave its highest yields from late December and early January plantings, and Marquis did best when planted late in November. Oats and barley have produced better in early winter than in late winter plantings. Early Baart wheat yielded highest at 75 lbs. per acre, while somewhat heavier rates are usual for oats and barley.

Wheat receiving commercial fertilizer surpassed manured wheat which in turn outyielded the checks and wheat receiving superphosphate (acid phosphate). Application of sodium nitrate to wheat either in the soft dough or hard dough stages increased yields when the last irrigation was given in these stages and noticeably increased the protein content of the grain. Wheat treated with nitrogen from several sources averaged 2.2 per cent more protein than wheat receiving no nitrogenous fertilizers.

Barley yields after corn considerably exceeded those after hegari, and an annual application of 7 tons of manure per acre did not entirely overcome the harmful effect of the hegari.

Storage tests with small grain have been noted earlier (E. S. R., 60, p. 40).

Nomenclature of the abacá plant, E. B. Copeland (*Philippine Jour. Sci., 33 (1927), No. 2, pp. 141–153*).—The names applied to the source or sources of abacá fiber (*Musa* spp.) are discussed briefly from translations of early descriptions.

The effect of spacing on the yield of cotton, C. A. Mooers (*Jour. Amer. Soc. Agron., 20 (1928), No. 3, pp. 211–230, figs. 4*).—Review of spacing tests with cotton in Texas and other Southern States gave evidence that with 3-ft. rows 3 in. could be allowed either way from the best spacing without noticeable effect on yield. Somewhat closer spacing appeared necessary under conditions of high productivity than low productivity. Texas data on 2 plants per hill were hardly conclusive, while Alabama and South Carolina results slightly favored 2 or 3 plants per hill rather than 1, but were unfavorable to 4. Curves showed the best spacing to occur most often within 12- to 16-in. limits, with indications that slightly wider spacings may be warranted under Texas conditions. Exceptions may exist where closer or wider spacing than the general average may be justified. Spacing recommendations with tolerances have also been indicated in another contribution from the Tennessee Experiment Station (E. S. R., 58, p. 831).

Varieties of cotton for central east Texas, H. F. MORRIS and G. T. MCNESS (*Texas Sta. Bul. 384* (*1928*), *pp. 36, figs. 2*).—Comparative trials of cotton varieties during the period 1918 to 1927, supplementing earier work (E. S. R., 43, p. 33), showed Acala, Half-and-Half, and Lightning Express to lead with similar acre yields of lint. Acala is probably most suitable for the region considering its yield, staple, earliness, and ease of picking. Half-and-Half is too short in lint length, and Lightning Express, although leading in money value per acre, lint length, and earliness, is deemed hard to pick. Truitt, New Boykin, Lone Star, and Rowden are also considered good varieties for the section. Data are also given on boll size, length and percentage of lint, earliness, and comparative acre values of the principal varieties tested.

Studies in Gujarat cottons.—Part V, Variability in certain economic characters, particularly in seed weight and weight of lint per seed in pure strains of Broach-deshi cotton, M. L. PATEL and H. H. MANN (*India Dept. Agr. Mem., Bot. Ser., 15* (*1928*), *No. 7, pp. 157–217*).—Studies in eight pure lines of Broach-deshi cotton reported in the fifth of this series (E. S. R., 57, p. 828) gave evidence that the seed weight and lint weight per seed from flowers opening on a single day are slightly less variable than from the total flowers of a strain. The boll maturation period seemed to be distinctly but slightly correlated with seed weight and affects the lint weight per seed to a greater extent. The kind of branch bearing the bolls had no relationship with the seed weight. There was evidence, however, that bolls arising indirectly from primary monopodia give less lint per seed than other bolls from the same plants. A definite relationship was apparent between the length of branch internodes and the seed weight and lint weight per seed on the bolls borne at the succeeding nodes. Seeds from bolls borne after long internodes were heavier, and the lint weight per seed was also greater. Number of seeds per boll did not usually markedly affect the seed weight and weight of lint per seed. Seeds from 4-locked bolls were usually somewhat lighter and the lint weight per seed slightly greater than those from 3-locked bolls.

In general there seemed to be a marked tendency for both seed weight and weight of lint per seed to decrease in the later developed parts of the plant and in the younger parts of branches, especially in the case of sympodial branches. The extent of decrease is also very high on this kind of branches. A type of plant should evidently be preferred which has numerous short sympodia rather than one with few long fruiting branches. It appeared that the lint weight per seed tended to diminish faster than the seed weight, i. e., for the ginning percentage to be less on the younger parts of shoots. Of the several boll characters studied for variation the weight of seed cotton per boll varied the most and the maturation period the least.

Selection in the jowars of the Bombay Karnatak, G. L. KOTTUR and V. M. CHAVAN (*Bombay Dept. Agr. Bul. 151* (*1928*), *pp. 24, pls. 5*).—This account of improvement work with jowar (*Andropogon sorghum*) describes important varieties, agronomic characters, and the extent of cross-pollination.

Austrian winter field peas, R. W. Hamilton (*Clemson Agr. Col. S. C., Ext. Circ. 96 (1928), pp. 4, fig. 1*).—Practical cultural instructions.

Potato experiments (*Ohio Sta., Dept. Hort., Expt. and Research Work, 1926–27, pp. 10–13, figs. 2*).—Investigations reported on in this pamphlet, including fertilizer tests, trials of certified seed (E. S. R., 53, p. 529; 55, p. 33), dates of planting potatoes (E. S. R., 56, p. 337), and sprout production (E. S. R., 59, p. 223), have largely been noted from other sources.

Potatoes in protracted fertilizer tests in the 3-year rotation, potatoes, wheat, and clover, showed potash hunger on all plats receiving no potassium in the fertilizer. Data cited showed good responses in yield to potassium and to phosphorus and also to manure, whereas nitrogen applications increased the number of small tubers. The clover seemed to supply all of the nitrogen needed.

Tuberization of potatoes increased by X-rays, E. L. Johnson (*Science, 68 (1928), No. 1758, p. 231*).—Seed tubers of certified Early Ohio potatoes, either unsprouted or sprouted, when irradiated before planting at the University of Colorado produced more tubers per hill but with a smaller average weight per tuber than untreated seed of the same stock.

Relation of sorghum roots to certain biological processes, B. D. and J. K. Wilson (*Jour. Amer. Soc. Agron., 20 (1928), No. 7, pp. 747–754*).—In tests at Cornell University soil cultures containing sorghum roots lost supplied nitrates faster and evolved carbon dioxide more rapidly than cultures containing corn roots, and an organism, "guttation," known to assimilate both nitrate nitrogen and carbohydrates, thrived better in the sorghum root cultures. The results suggested that the injurious after effects of sorghum may be associated with the comparative ease with which its roots are oxidized in soil, which process being accompanied with an increase in the number of soil organisms and in the assimilation of nitrate nitrogen would tend to deplete the available nitrogen. The extent to which these processes go on in soil when young plants need nitrogen may determine the degree of injury which sorghum exerts on following crops.

See also earlier notes by Breazeale (E. S. R., 52, p. 834) and Conrad (E. S. R., 59, p. 135).

Proceedings of the American Soybean Association (*Amer. Soybean Assoc. Proc., 1 (1925–1927), pp. 192, figs. 7*).—The history and activities of the association since its organization in 1920 are reviewed, and summary accounts are given of business meetings from 1920 to 1927, inclusive, and field meetings from 1920 to 1924, with detailed reports including papers presented on soy bean breeding, growing, and utilization, of the field meetings in Washington in 1925, in Mississippi in 1926, and in North Carolina in 1927.

Report of the Pasuruan, Java, Sugar Experiment Station for 1927 [trans. title], V. J. Koningsberger, E. C. von Pritzelwitz van der Horst, P. Honig, et al. (*Verslag Proefsta. Java Suikerindus. Pasoeroean, 1927, pp. 245, figs. 20*).—Experimental and administrative activities reviewed for 1927 embrace agronomic studies including cultural, varietal, and fertilizer tests, breeding and cytological experiments and soil studies with sugar cane, entomological investigations, mill control, and investigation of technological and chemical problems involved in the manufacture of sugar from sugar cane.

Fertilizer studies with sweet potatoes, G. V. C. Houghland (*Soil Sci., 26 (1928), No. 4, pp. 291–304*).—Fertilizer experiments with sweet potatoes on Norfolk sandy loam at Snow Hill, Md., under the direction of the University of Maryland showed the soluble nitrogen carriers, e. g., urea, sodium nitrate, and ammonium sulfate, used in a 3-8-8 (N-P-K) fertilizer, to produce the highest average yields of prime sweet potatoes. The 60:40 per cent ratio led the inorganic: organic combinations. Tests during one year indicated Leunasalpeter to be a very suitable nitrogen carrier for the crop when used with organics, comparing favorably with sodium nitrate and ammonium sulfate. More prime sweet potatoes were made with potassium than without, potassium sulfate, potassium chloride, and manure salts ranking in order. Application of 750 lbs. per acre of 6-16-16 compared favorably with 1,500 lbs. of 3-8-8 fertilizer. A green manure cover crop of rye and vetch used in the rotation in conjunction with the regular fertilizer application seemed responsible for significant increases in yields.

Tobacco culture in Florida, W. B. Tisdale (*Florida Sta. Bul. 198* (*1928*), *pp. 375-428, figs. 16*).—Information is given on the soils, cultural and field methods and harvesting and curing practices, and curing barns suitable for the production of cigar wrapper tobacco and bright or flue-cured tobacco in Florida, diseases, and insect pests. Seed selection, the construction of tobacco shades, and the history and distribution of tobacco culture in the State are also discussed.

Fertilizers for Deli tobacco [trans. title], **J. Kuijper** (*Meded. Deli Proefsta. Medan, 2. ser., 56* (*1928*), *pp. 71; Eng. abs., pp. 70, 71*).—Experiments with wrapper tobacco in Deli, Sumatra, during the period 1922–1926 showed that ammonium sulfate produced better leaf length, more fallow and even color, and better quality of wrappers. Double superphosphate (acid phosphate) improved leaf length rather less than did nitrogen and gave a brighter color. Applications of more than 5 gm. of each of these salts per plant should be made carefully and after field tests. Where the phosphorus need is higher, from 17 to 25 gm. of Thomas basic slag may be applied about 2 months before planting, together with 5 gm. of superphosphate, the quantity so applied not harming color or quality. More than 1 or 2 gm. of potash per plant may be prejudicial to color and quality. Soil type rather than analysis should be considered in the rate of application.

The climate of wheat in the world, G. Azzi (*Le Climat du Blé dans le Monde. Conférence Internationale du Blé, Rome, 1927. Rome: Inst. Internatl. Agr., 1927, pp. VII+1161, pls. 13, figs. 29*).—Concerned with the ecological bases of wheat culture in the world, this volume considers yield from the viewpoint of quantity and quality of product and quality of seed and discusses in detail the relative influences of the several environmental factors on wheat production. The major portion of the work is devoted to an extensive compilation of information on the climatic conditions unfavorable to wheat, wheat diseases, principal wheat varieties, periods of seeding, heading, and harvest, and altitudinal limits for wheat in the political divisions and subdivisions of the world. The planting and harvest periods, meteorological phenomena, and ecological classification of wheats are discussed in conclusion for the world as a whole.

Cultural experiments with wheat for grain and forage production, C. E. Hill (*Washington Col. Sta. Bul 227* (*1928*), *pp. 46, figs. 9*).—Cultural experiments with wheat at the Waterville Substation in cooperation with the U. S. Department of Agriculture during the period 1919–1927 are reviewed, with information on environmental and agricultural conditions and recommendations for wheat production in the region.

Maximum yields were obtained from fall plowing followed by clean cultivation throughout the next year; early spring plowing; plowing at any time during the summer fallow year provided the land be cultivated clean from early spring until plowing; and in light-soil areas, from clean cultivation without plowing. Grain and forage yields decreased with each 2 weeks delay in plowing from April 15 to June 15, and was lower as a group on October 15 than on October 1 plantings. The percentage of grain did not differ much in the crop from fall, early spring, or June plowing when the summer fallow was kept clean until seeding, although the proportion of grain was generally higher on land plowed dry in June. Moisture penetration was generally deeper on fallow fall plowed, spring plowed, or disked than on winter wheat stubble or fallow not plowed until June It was indicated that plowing should be deep enough to turn under stubble and trash, and that tillage after plowing should suffice to control weed growth and to prepare a firm, even seed bed.

Tests suggested seeding in September if conditions favor germination, but where seeding must be so late that plants can not emerge in the fall the sowing of spring wheat is advised. For average conditions 60 lbs. of dry wheat is the indicated acre rate, although quantities between 30 and 120 lbs. on early summer fallow did not appreciably affect yields. Drilling was superior to broadcasting, and the value of seeding winter wheat in furrows was shown. Spring harrowing winter wheat reduced yields, particularly harrowing early in the spring.

Within the same variety or selection yellow berry or soft wheat seemed due to insufficiency of available nitrogen in the soil for the quantity of grain produced. It is suggested that in all instances where yellow berry or soft wheat has been produced the quality of the grain would be improved and the yields increased by tillage or cropping methods which would increase the amount of available nitrogen without decreasing the moisture reserve.

Test for moisture and protein before combining, E. J. BELL, JR., and W. O. WHITCOMB (*Mont. Agr. Col. Ext. Bul. 93 (1928), pp. 7, figs. 7*).—Popular instructions are given for taking wheat samples for moisture and protein tests and making the moisture test locally.

Experiments uphold heat drying process [for wheat] (*Northwest. Miller and Amer. Baker, 5 (1928), No. 9, p. 1216*).—Investigations by the National Research Council of Canada, the universities of Alberta, Saskatchewan, and Manitoba, and the Dominion Grain Research Laboratory demonstrated that grain can be dried without injury to its milling and baking qualities. It was agreed that 180° F. is the maximum safe temperature for the drying air entering the grain, and this only if the grain is not dried from too high an initial moisture content nor to too low a final moisture content. When crops of Marquis, Red Bobs, and Garnet wheat were variously treated, including weathering until after snowfall and damp storage up to 6 months, it was observed that moderate weathering might improve quality, whereas severe weathering if resulting in sprouting could injure wheat, particularly in keeping qualities and milling yields. Sound grain stored during winter in a damp condition did not deteriorate in quality, and usually the normal improvement due to aging took place.

With all makes of driers some samples were dried without damage to milling and baking quality while many others were injured, indicating that operating conditions and the skill of the operator are probably more important than the type of drier.

Parker Marquis and Hard Federation wheats were both found inferior to Marquis in milling and baking quality.

Investigations on the germination of hard seed of legumes [trans. title], H. WITTE (*Meddel. Statens Cent. Frökontrollanst. [Sweden], No. 3 (1928), pp. 60–69; Eng. abs., pp. 68, 69*).—Germination tests soon after harvest of seeds of clover and other forage legumes showed that the original hardness of seeds differs in duration and intensity in different plant species and also varies in different seed samples of the same species. No definite relation was found between the hardness and the color of the seeds in red clover. Red clover seed tested just after harvest had a much higher hard seed content than samples remaining in the warm laboratory for from 4 to 13 months. The hard seed content of commercial seed depends on the species, maturity, harvesting, storing, and hulling conditions.

[Seed testing in England and Wales, 1927], A. EASTHAM ET AL. (*Jour. Natl. Inst. Agr. Bot., 2 (1928), No. 1, pp. 56-84, figs. 2*).—These pages include the tenth (1927) annual report of the Official Seed Testing Station for England and Wales, which tabulates and discusses the average purity and germination for 22,837 samples of agricultural seed received from different sources in these countries during the year ended July, 1927; an examination in seed testing; and papers including Seed Control in the United Kingdom, by A. W. Monro (pp. 71-76), Trade Aspect of Seed Testing, by G. P. Miln (pp. 76-80), and Some Technical Aspects of Seed Testing, by A. Eastham (pp. 81-84).

[The Swedish State Seed Testing Station], H. WITTE (*Meddel. Statens Cent. Frökontrollanst. [Sweden], No. 3 (1928), pp. 1-59, figs. 3; Eng. abs., pp. 58, 59*).—Tests of agricultural seed samples for germination, purity, and other characteristics, and field tests of seed of different crops and vegetables for varietal purity and diseases, are reported on for the year 1926-27.

Recent Indiana weeds, 1926, A. A. HANSEN (*Ind. Acad. Sci. Proc., 42 (1926), pp. 250, 251*).—Weed plants recorded as new to the State since the previous report (E. S. R., 56, p. 640) include field peppergrass (*Lepidium campestre*), creeping yellow water cress (*Radicula sylvestris*), squawweed (*Senecio obovatus*), little barley (*Hordeum pusillum*), dove's foot crane's bill (*Geranium molle*), red orache (*Atriplex rosea*), and halberd-leaved orache (*A. hastata*).

Recent Indiana weeds, 1927, A. A. HANSEN (*Ind. Acad. Sci. Proc., 43 (1927), pp. 319, 320*).—Plants reported as recently occurring as weeds include cultivated garlic (*Allium sativum*), beefsteak plant (*Perilla frutescens*), Spanish bayonet (*Yucca filamentosa*), blueweed (*Echium vulgare*), leafy spurge (*Euphorbia esula*), purple-head sneezeweed (*Helenium nudiflorum*), and meadow barley (*Hordeum nodosum*).

Kunai or coconuts? G. H. MURRAY (*New Guinea Dept. Agr. Leaflet 63 (1928), pp. 2; abs. in Trop. Agr. [Trinidad], 5 (1928), No. 10, p. 262*).—Kunai (*Imperata arundinacia*) is described as the most serious weed in coconut plantations throughout the eastern Tropics. The growth and bearing of trees have been depressed by the grass, which so mats the soil that air and water do not penetrate freely to the coconut roots. Kunai also seems to have a toxic or poisonous action on coconuts and other cultivated plants. The control method held best is to plow the land after cutting the grass, gather and burn the uprooted roots, and then plant to Mauritius bean (*Stizolobium aterrimum*). Other cover crops can follow the Mauritius bean after a year's growth.

HORTICULTURE

[Horticultural investigations at the Alabama Station], C. L. ISBELL, R. W. TAYLOR, and W. D. KIMBROUGH (*Alabama Sta. Rpt. 1927, pp. 26-30, 31, 32 figs. 3*).—A progress report (E. S. R., 59, p. 632).

Among pecan varieties Delmas developed scab so severely that no nuts matured. Pabst and Schley nuts showed some scab, and a few lesions developed on Success. Centennial, Frotscher, Columbian, Russell, Stuart, and Van Deman showed no infection.

The removal of a ⅜-in. ring of bark from pecan shoots in late March resulted in the death of the wood above the wound, but lower buds developed and behaved as normal shoots, even to fruiting. Buds remaining on pruned shoots also developed normal producing shoots.

Improved blueberry varieties from Whitesbog, N. J., with the exception of Harding failed to endure the summer climate. Some of the southern blueberry plants produced self-fertile blossoms.

The Winesap apple was the most productive variety in the Talladega County variety test, trees just coming into fruiting. Winesap and Golden Delicious developed the largest trees. In a pecan variety test in Marshall County trees above the average in weight per unit of length showed the best survival and subsequent growth.

In cabbage fertilizer studies in Mobile County a complete fertilizer gave better results than did nitrate of soda alone or in combination with superphosphate (acid phosphate). The use of 2,000 lbs. per acre of superphosphate in a complete fertilizer gave smaller yields than did 1,000 lbs., and 500 lbs. of muriate of potash gave poorer results than 250 lbs. Divided applications of nitrate of soda were superior to one application before planting.

As measured in plant growth dried blood was apparently somewhat the best source of nitrogen for strawberries. Complete fertilizers were beneficial to the Missionary strawberry growing in Norfolk sand. Spring applications of nitrate of soda apparently increased the quantity of second blooms, flower buds of which were evidently produced in the spring. Fertilizer treatments had no appreciable effect on moisture, acid, or sugar content of the strawberry. Sugar was higher in the second than in the first crop of berries. A somewhat higher respiration rate found in berries from the more vigorous plants had no apparent effect on keeping quality at room temperature.

Cabbage, potatoes, tomatoes, and watermelons grown on Norfolk sandy loam benefited from the use of complete fertilizer. Split applications of nitrate of soda were beneficial. The use of ammonium sulfate and Leunasalpeter in large quantities induced an acid condition injurious to cabbage. Fertilizer had no apparent influence on edibility or keeping quality of the various vegetables.

[Horticultural investigations at the Florida Station], R. W. RUPRECHT, A. F. CAMP, and J. H. JEFFRIES (*Florida Sta. Rpt. 1927, pp. 34–36, 52–56, 58–61, 92–96, figs. 4*).—As indicated in the preceding report (E. S. R., 56, p. 832), modifications in the content of potash in fertilizers had no appreciable influence on the taste, sugar, or acid content of either oranges or grapefruits. Analyses showed, however, a higher percentage of potash in the fruits of the potash-fertilized trees. Comparing muriate of potash, low-grade sulfate, and high-grade sulfate as sources of potash for citrus no marked differences in yield or quality were found which could be attributed to the source of potash. Large applications of ammonia apparently aided Satsuma oranges to hold their foliage during cold weather. In fertilizer experiments in Dade County with tomatoes the manganese-treated plants gave the largest yields, but at Bradenton manganese did not give any beneficial results. Copper sulfate gave some response in Dade County.

In pecan fertilizer studies, as determined by an analysis of the nuts, the only difference that could be correlated with fertilizer was in the potash plats. In four varieties, Schley, Curtis, Moore, and Moneymaker, the nuts from the no-potash plat had a lower fat and a higher protein content than nuts from trees receiving a complete fertilizer. Celery fertilizer studies at Sanford again showed that concentrated materials could be successfully used.

Famous and Stewart, new accessions to the strawberry plantings, were exceeded in production by Missionary only. No significant differences in yield or quality of berries were observed in Missionary plants obtained from Maryland, Arkansas, and Florida. In tung oil investigations *Aleurites montana* seemed more vigorous but less hardy than *A. fordii.* A record is given of various new plants set out during the year. Blueberry propagation was most successful in the case of 8- to 12-in. cuttings of young wood taken in midwinter and planted in outdoor beds. From 6 to 8 months were required for rooting. Roses were satisfactorily produced under glass. During the optimum growing period marketable buds were produced in 27 days from the beginning of vegetative growth. Bean seed obtained from the arid West proved superior to the general run of seed.

Measurements taken in the nut variety orchard showed the greatest growth in trees that were strong and vigorous when set. Several *Juglans regia* walnut trees were killed during the winter. Measurements on nut stocks showed the maximum growth in *Hicoria aquatica,* the water hickory. Plump, well developed pecans averaging from 75 to 90 per pound gave the most rapid growing seedlings. Nuts from varieties susceptible to scab produced highly susceptible seedlings. Results of fertilizer studies with pecans suggested the advisability of using nitrogen derived from both organic and inorganic sources. Superphosphate (acid phosphate) and potassium sulfate were apparently favorable sources of phosphoric acid and potash. Rejuvenated pecan trees made very satisfactory growth and yield gains. Reporting for the Citrus Substation Jefferies states that it was very difficult to distinguish as to the quality of fruit produced on 5 and 10 per cent high-grade sulfate of potash plats.

[Horticulture at the Georgia Coastal Plain Station] (*Georgia Coastal Plain Sta. Bul. 9 (1928), pp. 39–45, 49–59*).—Varietal and fertilizer studies with vegetables and fruits again (E. S. R., 58, p. 738) constitute the major horticultural activities. Limiting the number of watermelons to the hill slightly increased the size of individual melons but reduced the total yields of marketable individuals.

[Horticultural work at the Duluth, Minn., Substation], M. J. THOMPSON (*Minnesota Sta., Duluth Substa. Rpt. 1926–1927, pp. 25–29, 54, fig. 1*).—Information is presented on the comparative yields of varieties of vegetables in the 1926 and 1927 seasons, continuing earlier work (E. S. R., 55, p. 741).

Sulfate of ammonia was found effective in stimulating growth and yields in the apple. Heavy mulching with strawy manure in a lesser degree accomplished the same results. Yellow Transparent was the only apple to ripen fully at Duluth. As a whole, apples gave better results than did plums. The Pomona currant was the most productive of six varieties tested. The Houghton led in gooseberries and the Minnehaha in strawberries.

[Horticultural work at the Ohio Station] (*Ohio Sta., Dept. Hort., Expt. and Research Work, 1926–27, pp. 3–9, 10, 14–16, figs. 3*).—In this pamphlet, designed to serve as a visitors' guide, brief summaries are presented of some of the outstanding results of experimental work of the horticultural division as to fruit varieties, culture, pollination, ringing, and fertilizers, the fertilizing of lettuce, and the effect of lime on truck crops.

[Horticultural investigations at the Tennessee Station], J. A. McCLINTOCK (*Tennessee Sta. Rpt. 1927, pp. 35, 36, 37, 38*).—Observations on a number of first generation selfs of the Aroma strawberry showed a number to compare very favorably in plant production with Aroma and Klondyke. Certain of the seedlings produced crops despite a spring frost that injured standard varieties. Certain proprietary sulfur materials tested in 1926 and 1927 as summer sprays for peaches caused serious injury to twigs and leaves. The self-boiled lime-sulfur or the sulfur-lime dry mix (Tennessee formula) are recommended as safe sprays for peaches.

The Young dewberry was found less susceptible to disease than was Lucretia, but at the same time less productive. The Van Fleet raspberry was the most vigorous of all raspberries tested.

Wisconsin Hollander and Wisconsin All-Seasons proved to be satisfactory cabbages, producing large, firm heads which retained their shape and quality. Progress was made in the selection of disease-resistant strains of the Wakefield cabbage. Tests indicated that cutting the shoots of asparagus even for a brief period in the third year reduces top and root growth. Progress is noted in the production of disease-resistant rhubarbs. The Creole onion was not equal to the Bermuda for producing green onions. The Marglobe tomato was found promising. Staking reduced the amount of fruit decay in the tomato. Potting tomatoes in 4-in. bands increased survival and resulted in earlier and larger yields of fruit. The harlequin bug was satisfactorily controlled on the late cabbage crop by the use of pyrethrum soap sprays. The source of bean seed was found to influence materially the percentage of disease in the resulting crop.

Tomato fertilizer experiments in Chautauqua County, New York, P. WORK (*New York Cornell Sta. Bul. 467 (1928), pp. 24, figs. 7*).—Investigations in Chautauqua County with canning crop tomatoes showed phosphorus to be the principal limiting fertilizer ingredient, significant increases in yield resulting from each increment in phosphorus applied. Nitrogen, on the other hand, did not give significant results, due apparently to a fairly good supply in the soil, which had been in alfalfa for several years prior to the experiment. Chemical determinations upon the leaves showed significant nitrogen differences, 0.536 per cent for the high nitrogen and 0.441 per cent for the no nitrogen plants. There were no significant differences in carbohydrate content. Phosphorus treatments did not significantly influence the nitrogen or carbohydrate of the leaves.

Potash in the quantity used in the check plats, 600 lbs. of muriate of potash per acre, significantly increased yields, but larger applications were not increasingly beneficial. Applications per acre of 10 tons of manure alone or of 5 tons of manure supplemented with 800 lbs. of superphosphate (acid phosphate) failed to equal the check treatment, 38 lbs. of ammonia as nitrate of soda, 64 lbs. of phosphoric acid as superphosphate, and 100 lbs. of potash as muriate of potash. Applications of either 10 or 20 tons of manure with phosphorus were deemed about equivalent, and 10 tons of manure in addition to the check improved the yield. Data on the dry weight of vines,suggested a close positive correlation between plant growth and yield. The relation between the set of fruit and yield was not established. Extra care taken in growing plants did not appear to be economically justified unless early fruit was sold at high prices.

Fruit thinning, E. F. PALMER (*Fruit Growers' Assoc. Ontario Ann. Rpt., 59 (1927), pp. 24–29*).—Thinning the fruit of plum trees had a beneficial influence not only in increasing the size of the fruits but in reducing winter injury, especially in the Reine Claude variety. Furthermore, thinned trees blossomed full the subsequent spring, while unthinned trees produced little bloom. An unthinned Grand Duke plum orchard was rendered entirely worthless by winter injury. The decreased total yields following thinning were more than offset by the greater value of the remaining fruit. Thinning tended toward annual production, especially in overbearing varieties such as Burbank and Shiro. The year following thinning trees bloomed earlier, matured their fruit earlier, and ripened their fruit more uniformly.

Compatible and non-compatible graft unions, M. J. HEPPNER and R. D. MCCALLUM (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 137, 138*).—Observations on stock and scion compatibility in various fruit orchards of California suggested that most of the Japanese plums can be grafted successfully on most of the European types, while reciprocally European are a failure on Japanese roots. Among varietal incompatibilities noted were Climax on Burbank, Kelsey on Santa Rosa, California Blue on Giant, and Grand Duke on Hungarian. Peaches, almonds, and apricots were generally incompatible with Japanese and European plums. On the other hand, all varieties of peaches showed affinity for almond roots, and almonds and apricots grew well on the peach. Plums of the Japanese type generally thrived on peach, but several of the Europeans, including California Blue, Imperial, Robe de Sergeant, and Sugar did not. Certain plums showed marked affinity for apricot; others possessed no affinity for this stock. Almonds showed but little affinity for the apricot, and reciprocally apricots failed on almond roots. Certain plums, varieties recorded, thrived on almond roots, while others failed.

Further notes on apple stocks, R. H. Roberts (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 134–136*).—That stock influence is a stem effect was indicated in observations on scions grafted directly on piece roots and upon the stems of seedlings. The trees resulting from the piece roots produced strikingly uniform roots characteristic of the scion variety, while those from stem grafts produced trees having variable root characters. Double worked trees had roots characteristic of the intermediate variety. Less than an inch of stem sufficed to give results with certain stocks. Clonal rootstocks varied in their response to the scion variety and also in their influence on the scion. Limited records indicated that a tree on its own roots represents its maximum growth possibilities.

The preparation of grafts so that the top bud was in line with the point of the callus union again gave (E. S. R., 58, p. 138) the best stands and the most uniform trees. The source of the scion and the method of storage affected the percentage of success. The season of the rootstock had little influence upon the initiation of growth in the scion. On the average clonal stocks gave less uniform stands and growth of grafts than did seedling stocks. No consistent varietal difference was noted between seedlings, ovule parent alone known, when grafted to four varieties. Piece root grafts made less growth than did crown root grafts. Medium and large-sized seedlings gave the best results. Bud position and also the variety of the stock influenced the amount of crown gall.

Influence of scion leaves on the quality of apples borne by the stock, A. J. Heinicke (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 143–146*).—That apples borne below the graft may be influenced by the scion was indicated in observations upon the fruit of young McIntosh trees top-worked with various varieties. McIntosh apples below King scions closely resembled the King in color, flesh texture, and quality. McIntosh apples below Red June scions ripened nearly 2 months earlier than normal but were little changed in appearance. A similar result was noted with apples below Benoni scions. Presumably the leaves of the scion variety supplied nutrients to the McIntosh apples and along with the nutrients factors or agents for their synthesis.

Movement of fat in apple shoots, H. D. Hooker (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 185–187*).—Analyses at the Missouri Experiment Station of samples of shoots collected in April and May from 5-year-old Jonathan trees showed a marked increase in the percentage of fat in 1-year-old wood, especially at the tips, in early April, followed by a decrease in May. Analyses made of samples of shoots collected April 2 and 26 from four mature Jonathan trees, two of which were fertilized with ammonium sulfate, showed a distinct movement of fats toward the tips. In certain shoots girdled on April 2 there was no gain in nitrogen or fat, suggesting that neither of these substances passed the wounds. The remarkable similarity noted in the relative amounts of fat and nitrogen that moved toward the tips is considered significant. The ammonium sulfate increased the translocation of both fat and nitrogen in the ungirdled shoots.

A study of the effect of commercial fertilizers on the performance of apple trees, J. R. COOPER (*Arkansas Sta. Bul. 227 (1928), pp. 61, figs. 14*).—That phosphorus had a beneficial influence on yield and growth of Ben Davis apple trees was shown in experiments at Springdale and Fayetteville. Phosphorus resulted in a heavier production of fruit spurs, some increase in fruit setting, and a definite increase in yield. Increases in growth though evidenced in comparisons of averages were not significant. Phosphorus had a very decided beneficial influence upon cover crops. Nitrogen, as was expected, gave very definite gains in vegetative growth, number of fruit spurs, set of fruit, and in yields. Nitrate of soda was superior to sulfate of ammonia in the first and second years following application. Potassium resulted in no gains, and on the basis of averages was slightly harmful. Some evidence was obtained that a supplemental treatment of 10 tons of manure per acre in addition to commercial fertilizers increased yields.

Due to uncertain causes, possibly alternate production, freeze, and blight injury, Yellow Transparent trees were not benefited by any fertilizer treatment. Heavy pruning and fertilization induced annual fruiting in Yellow Transparent but did not increase total yields.

Fertilizer increased the number but decreased the size of individual fruits. Nitrogen delayed ripening slightly and reduced red color because of the denser foliation. Potassium and phosphorus alone or in combination had no effect on fruit color. No fertilizer had any apparent influence on quality. Ranked according to net gains in yield the 8-4-0 (P-N-K) fertilizer was most effective. followed by nitrogen used alone. The dropping of flowers and fruits throughout the season followed the same general curve as response to fertilizers. The total number of fruit spurs per tree varied directly with the fertilizer and other treatments. Pruning of any kind reduced fruit production. A definite positive correlation was noted between tree vigor and production. A higher correlation was recorded between yield and terminal growth of the same season than between yield and terminal growth of the preceding year Annual trunk increment was apparently the most reliable index to the performance of the apple tree.

Approved and suggested practices in peach production and marketing for New Jersey (*New Jersey Stas. Bul. 477 (1928), pp. 16*).—Supplemented with information in regard to grades, production outlook, market statistics, etc., brief digests are presented of production and marketing practices as approved at a conference of leading peach growers and specialists.

Pear black-end and its relation to different rootstocks, M. J. HEPPNER (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 139-142*).—Black end, a physiological discoloration or hardening of the calyx end of pears, was found to be definitely associated with the type of rootstock employed. In single orchards with part of the trees on *Pyrus communis* and part on *P. serotina* injury often reached 100 per cent in the trees on the Japanese (*P. serotina*) roots, with no injury whatsoever on trees on French roots. Irrigation was found to have no bearing on the situation. In respect to other rootstocks, no diseased fruits were found on pear trees on quince roots but they were noted in trees on *P. ussuriensis* and on Kieffer.

Fruit varieties in Ohio.—III, Damson plums, J. S. SHOEMAKER (*Ohio Sta. Bul. 426 (1928), pp. [1]+22, figs. 6*).—In this, the third of a series (E. S. R., 58, p. 233), there are described and discussed 24 varieties of Damson plums.

The relation of season of pruning out old Cuthbert raspberry canes to amount of winter injury, H. D. LOCKLIN (*Western Washington Sta. Bul. 9-W (1928), pp. 12*).—A determination of the winter injury of Cuthbert raspberry plants, the old canes of which were removed in mid-August, mid-November, and mid-February, showed no significant differences in the amount of tip injury that could be associated with the time of removal. It is conceded that the very slight difference in favor of winter pruning might be of greater significance in a really severe winter. It is suggested that the greatest hope for overcoming winter injury in the raspberry lies in the development of new varieties which ripen their canes earlier. Changes in cultural and fertilizer practices failed to bring about this result.

Ringing and notching experiments with the mango, P. V. WAGLE (*Agr. Jour. India, 23 (1928), No. 4, pp. 287-289, pls. 2*).—Observing in a single season three types of mango trees (1) fully flowered, (2) partially flowered, and (3) without flowers, a study was made of the effect of ringing and notching upon fruit production in all three types. In the case of the fully flowered tree, ringing induced within about 3 weeks following the operation a number of dormant buds to develop into flower heads, with the result that ringed branches produced four or five fruits as compared with the usual single fruit. Notching, on the other hand, produced only a single flower head. Neither ringing nor notching prevented the development of terminal buds.

On partially flowered trees ringing gave positive results where the flowering was scattered over the tree, but in trees where the flowers were restricted to certain branches ringing was effective only on the producing limbs. The effect of the treatments on the purely vegetative trees was entirely negative. Ringing was successful only in the months of November, December, and January.

Primulas for garden and greenhouse, E. H. M. COX and G. C. TAYLOR (*London: Dulau & Co., 1928, pp. 127, pls. 16*).—A handbook of culture of hardy and tender Primulas in which attention is directed to the many splendid new introductions from China and an attempt is made to classify into related groups.

FORESTRY

Studies in tolerance of New England forest trees.—VIII, Effect of spacing in a jack pine plantation, W. R. ADAMS, JR. (*Vermont Sta. Bul. 282 (1928), pp. 55, figs. 21*).—A further contribution to a general series (E. S. R., 58, p. 743).

Data recorded in a jack pine (*Pinus banksiana*) plantation with trees spaced 2 by 2, 4 by 4, 6 by 6, and 8 by 8 ft. showed an early retardation of growth in the 2 by 2 ft. plats. At the end of the eighth growing season the average diameters 1 ft. above ground were 1.44, 2.28, 2.75, and 2.98 in., and the average heights 12.21, 13.7, 13.59, and 13.69 ft., respectively, showing that diameter was much more adversely affected by close spacing than was height. The fact that the greatest annual height increment in all plats occurred the year after the maximum diameter increase suggests a correlation between diameter growth and height growth of the succeeding season.

Microscopic examinations of annual ring growth showed a general tendency for the greatest width to progress upward each succeeding year, although in the 8 by 8 ft. trees there was only a slight tendency toward a progression. The width of the annual ring for any year was dependent upon both the number and size of the tracheids produced that year. The average size of the tracheids increased with the larger spacings. The length of the internodes was not dependent upon the length of the tracheids. Close spacing with its competition with other trees had a tendency to force a downward root growth. In the absence of competition the jack pine root system was typically shallow and spreading.

Chemical analyses of representative trees from each plat showed an increase in the amount of soluble ash correlated with increased spacing but not in direct ratio, as was the case with dry matter. The efficiency of the needles in producing dry matter was much larger in the closely spaced trees. The amount and duration of light received within the 2-ft. spacing was above that needed for photosynthetic activity.

Variation in rainfall had only a slight influence on the width of the annual rings in trees suffering from competition. Under open conditions rainfall in the March–June period did affect the width of the rings but had no influence on height growth of the current year. In concluding the author points out that to avoid production losses in jack pine plantations the first silvicultural thinning should be made when competition begins to retard growth, which is approximately the time the lower branches commence to die.

Black locust and how to grow it, F. G. Miller (*Idaho Univ. School Forestry Bul. 2 (1928), pp. [2]+17, figs. 5*).—This comprises general cultural information, supplemented with yield and growth records taken in various woodlots.

The raising of basket willows from seed, H. P. Hutchinson (*Univ. Bristol, Agr. and Hort. Research Sta. Ann. Rpt. 1927, pp. 169–173*).—Attempts to hybridize varieties of basket willows under controlled experimental conditions failed, although crossing occurs under natural environments. Open-pollinated seeds of varieties of three species and one species hybrid were found to germinate strongly, 74 to 91 per cent. In outdoor plantings where the seed was covered with soil few plants appeared, but in the case of uncovered seeds strong germination took place, with all of the plants shortly succumbing to various diseases. Fair success was obtained in flats in the greenhouse where the soil was kept in a saturated condition. Seedlings reached a maximum height of 9 in. in the first growing season and 10 ft. in the second growing season. Seedlings set out in the open ground in the autumn of the first year suffered severe loss from insects and weeds, indicating the advisability of leaving young willow plants in the seed flats the first winter. The seedlings of the pure species closely resembled their known parent, while those of the hybrids showed wide segregation.

Bamboo and its uses in China, W. M. Porterfield, Jr. (*Chinese Govt. Bur. Econ. Inform., Booklet Ser. 2 [1927?], pp. [2]+77, figs. 17*).—A summary of general information on geographical distribution, habits of growth, culture, utilization, etc.

The forests of Suomi (Finland): Results of the general survey of the forests of the country carried out during the years 1921–1924 [trans. title], Y. Ilvessalo (*Commun. Inst. Quaest. Forest. Finland. No. 11 (1927), pp. IX+421+192, pl. 1, figs. 30; Eng. abs., pp. 321–395*).—A detailed report with extended English summary. Forest lands were classified in the four main divisions (1) productive, (2) poor growth, (3) waste lands, and (4) cultivated or otherwise used areas.

The protection forests of the Mississippi River watershed and their part in flood prevention, E. A. Sherman (*U. S. Dept. Agr. Circ. 37 (1928), pp. 50, pl 1, figs. 7*).—A general discussion of the present forestry situation in the Mississippi River Valley and of the part that forestry might play as a supplemental agency in controlling floods. It is pointed out that the Mississippi Basin was originally 60 per cent nonforested and is now 80 per cent. Certain critical areas in the valley are pointed out in which the nature of the soil, the slope, and precipitation provide conditions of rapid run-off with large silt deposits in the streams. Specific recommendations are presented which it is emphasized can only serve as a necessary supplement to engineering works.

Observations on cutover pulpwood lands in the Northeast, M. WESTVELD (*Jour. Forestry, 26 (1928), No. 5, pp. 649–664, figs. 2*).—Observations on sample plats established on the cut-over pulpwood lands of the northeastern United States showed a general sufficiency of spruce and balsam fir reproduction regardless of the severity of the cutting. Practically all of the reproduction was present prior to cutting. In mixed softwood and hardwood stands there was a tendency to leave an excess of hardwoods. There was noted a progressive diminution of seedlings with increase in the age of the cuttings. A close correlation was observed between the volume of spruce and balsam fir in the original stand and the amount of reproduction. Logging operations reduced the percentage of conifers in all types in the stands. In stands of the spruce flat type logging created a decided change in the proportion of spruce to balsam fir, the latter usurping the dominant position of the spruce, a fact attributed to the more rapid growth of young balsam firs.

In the softwood-hardwood stands prolific seeding by the residual hardwoods tends to increase the proportion of hardwoods in the new stand. Under natural conditions the more valuable spruce maintains its supremacy because of its longer life and greater tolerance to shade.

Soils influence reproduction by the fact that hardwoods thrive on well-drained areas to the detriment of the conifers. Exposure of the under soil by the removal of litter and vegetation greatly increased conifer germination, especially balsam fir, which quickly occupied such areas. Raspberries and other undergrowth that occupy cut-over lands favor hardwoods, which are able to reach the light sooner than the conifers. It is suggested that young hardwoods be removed soon after the fifth year. Dense slash killed advanced reproduction, softwood slash being more harmful than hardwood because of its compactness and slow decay.

The author outlines cutting, cultural, and slash disposal methods appropriate to different types of forests.

DISEASES OF PLANTS

Report of plant pathologist, O. F. BURGER (*Florida Sta. Rpt. 1927, pp. 62–77*).—Summary accounts are given of investigations conducted during the year.

Citrus canker (p. 62).—Previous investigations showed that citrus seedlings were not infected when the seed was germinated in soil infected with *Bacterium citri* (E. S. R., 56, p. 839). Subsequent experiments, by K. W. Loucks, have shown that young plants were not infected as they pushed through the soil, indicating that the organism does not live in the soil. When sprayed with cultures of *B. citri* the young seedlings were readily infected.

Scaly bark investigations, E. West (pp. 63, 64).—Field and laboratory experiments have shown that the grapefruit tree is less subject to scaly bark than some other varieties of citrus. Inoculation experiments with portions of diseased material gave negative results. Several strains of bacteria were isolated from infected trees, but seedling trees in the greenhouse had no infections after inoculation. Histological studies of diseased material have not revealed the presence of any definite causal agent.

Diseases of the citrus aphid, W. A. Kuntz (pp. 64–67).—Considerable attention was given to field and greenhouse studies of *Empusa fresenii*, an entomogenous parasite of *Aphis spiraccola* and other aphids. In greenhouse experiments all aphids were killed by the fungus in 43 days after incubation. Moist, foggy weather, but not necessarily rainy, was found to favor the rapid growth of the fungus.

Coconut bud rot, J. L. Seal (pp. 67, 68).—A definite correlation was found between rainfall and the outbreak of bud rot. Several forms of Phytophthora were isolated from infected trees, and when inoculated into coconut palms they readily produced the disease, but further studies did not show any specific differentiation of the forms.

Citrus blight or wilt, water injury, and related troubles, A. S. Rhoads (pp. 68–70).—Additional data (E. S. R., 56, p. 839) were secured that are said to point to a relationship between soil moisture conditions and citrus wilt. Dry weather following upon exceedingly wet periods during the season was found to have accentuated the disease, and such conditions are considered important contributing factors to the development of chronic blight or wilt. Suggestions are given of means by which the disease can be recognized before the actual wilting of the foliage.

Experiments were begun for the control of psorosis or scaly bark, the common practice of painting the lesions without scraping the bark having proved of little value.

Pecan disease work (p. 70).—Three experiments by R. E. Nolen on the control of pecan scab are reported. Spraying with a 4–5–50 Bordeaux mixture reduced scab on leaves and nuts to a greater extent than did a more dilute spray. Spraying three times during the season with Bordeaux mixture for control of scab on the husks showed that 26 per cent of the husks were diseased at the end of the season. Dusting experiments with copper arsenate lime and sulfur lime showed the best control of scab when a 20–10–70 copper-arsenate lime dust was used, and the sulfur-lime dust gave the poorest results. Considerable varietal variation in resistance to scab was noticed.

Potato diseases (pp. 70–73).—In investigations by L. O. Gratz considerable increases were obtained by spraying potato plants with Bordeaux mixture, and dusting with a copper-lime dust was found practically as beneficial as spraying. Some injury was observed following seed tuber treatment with organic mercury compounds for the control of Rhizoctonia.

In a comparison of healthy stock of seed tubers with selected spindle-tuber stock, greatly superior yields were obtained from the healthy stock. Yield tests of potatoes of different varieties and sources showed wide variations.

Truck crop diseases (pp. 73–75).—Extensive tests were undertaken by G. F. Weber, S. Hawkins, and D. G. A. Kelbert for the control of nailhead rust of tomatoes, but on the untreated plats less than 1 per cent infection was observed. Plants treated with copper fungicides are said to have remained green longer and were more luxuriant in growth than check lots or those treated with sulfur.

In cooperative work with the U. S. Department of Agriculture, in charge of S. P. Doolittle, tomato mosaic is said to have appeared and spread rapidly in fields early in 1927. The source of primary infection was not learned, but aphids and the cutting knife were found to spread the disease. Roguing out diseased plants and using nicotine dust reduced the spread of mosaic. The authors claim that experiments have shown that the disease is not seed borne, and preliminary tests indicate that the cause may persist for some time in the soil.

In plats of cucumbers dusted with sulfur compounds, better control of downy mildew was obtained than where copper sprays were used.

Strawberry investigations, A. N. Brooks (pp. 75–77).—Anthracnose is said to have appeared in August, and from infected plants a species of Colletotrichum was isolated that readily infected young runners. A root rot was observed in which small knots appeared on the roots and from which a species of Fusarium was isolated. Shipping experiments are said to have shown that moisture in the top layer of boxes in pony refrigerators may be corrected by the use of impervious paper as a top covering. Pony refrigerators were found not to lower the temperature of the fruit quickly enough for shipment, although they will maintain a sufficiently low temperature during transit. Precooling of fruit is recommended.

Plant pathology, C. D. Sherbakoff (*Tennessee Sta. Rpt. 1927, pp. 38–40*).—A brief report is given of studies on wheat deterioration, the investigations being confined to scab or head blight and to root rot (E. S. R., 57, p. 639). Some of the scab-resistant strains received from the Missouri Experiment Station were found to be particularly subject to other diseases under Tennessee conditions. Freezes in December, 1927, destroyed most of the remaining strains. Promising results are said to have been obtained in selecting strains of wheat resistant to root rot.

Experiments with crown gall were continued, and under the soil conditions sulfur treatment of the soil was found to check the development of the disease, while liming stimulated it.

Spraying for the control of apple diseases showed the importance of weather conditions in the application of fungicides.

Report of the acting Mycologist, J. D. Snowden (*Uganda Dept. Agr. Ann. Rpt. 1926, pp. 30–32*).—Condensed accounts are given of plant diseases affecting the crops listed during the period from November 10, 1925, to September 30, 1926, inclusive.

The haustoria of certain rusts and the relation between host and pathogene, M. A. Rice (*Bul. Torrey Bot. Club. 54 (1927), No. 2, pp. 63–153, pls. 9*).—It is stated that in case of rusted tissues the haustorium, though important, is not the exclusive organ for the nutrition of the fungus. Corn rust shows in the early stages abundance of intercellular mycelium and well-developed runners with dense contents, this fact suggesting or indicating that before the haustoria develop the fungus can draw some nourishment from the host through the cell walls. Vigorous intercellular growth may occur independently of haustorial activity. The same condition is observable in *Chrysomyxa pyrolae* on *Pyrola americana*.

The data presented, though they do not minimize the importance of haustoria, shift the emphasis in interpreting function. Plasticity in the haustorium is evidenced. Apparently, there is attraction between host nucleus and haustorium. The action of the host nucleus may possibly be offensive in some cases. In others, in which haustorium and host cell nucleus are frequently in intimate contact, no offensive action on either side is suggested. Details are discussed of cases examined or reported.

The cases which are cited are supposed to indicate that these rusts are all so hyperspecialized, even among the specialized rusts, that they do little damage to the host except at the time of spore production. For the Uredineae in general, the author thinks that an elaborate development of the haustorium has furthered the lack of disturbance in the regions of special metabolism of the host-parasite complex.

Studies in cereal diseases, I, II (*Canada Dept. Agr. Buls. 81, n. ser. (1927), pp. 79, figs. 20; 85, n. ser. (1927), pp. 32, figs. 9*).—The first two numbers of this series are noted below.

I. *Smut diseases of cultivated plants, their cause and control*, H. T. Güssow and I. L. Conners.—The three parts of this bulletin contain, respectively, general observations regarding smuts; descriptions of smut diseases, life histories, and treatments; and botanical description of smut fungi, with an analytical index.

II. *Root-rots and foot-rots of wheat in Manitoba*, F. J. Greaney and D. L. Bailey.—In studies designed chiefly to determine the fungus flora of wheat roots in Manitoba, the influence of various crop rotations on the fungus flora of wheat roots, and the pathogenicity of the fungi from wheat roots, it was found that Fusarium and Helminthosporium were very widely and consistently associated with wheat root rots. A preliminary survey in 1925 indicated that true take-all (*Ophiobolus cariceti*) was fairly common in certain parts of the Province, though further work was thought necessary to determine its extent and destructiveness. Results of two years' work with 10 different rotation series showed no conspicuous correlation between the severity of foot-rot infections and cultural practice. There seems to be no marked tendency for root-rotting organisms to accumulate in soil during six years' continuous wheat cropping.

The identity of the species of Fusarium isolated from wheat roots was not determined. *H. sativum* was isolated, and there appeared to be several physiologic forms of this organism differing either in morphology of spores, culture characters, or pathogenicity. Considerable differences appeared as to pathogenicity in 28 cultures of Fusarium tested in the greenhouse. Remarkable differences also appeared as regards pathogenicity of 16 cultures of *H. sativum*. Studies of 10 cultures of other root-infesting fungi, belonging to 5 widely different genera, showed that these were either nonpathogenic or only slightly pathogenic under the experimental conditions.

Seeds of wheat, oats, and barley, treated with Semesan and planted in inoculated soil, produced more vigorous seedlings than did the untreated seed, the stimulation being most pronounced in barley. In soil inoculated with Helminthosporium a higher percentage of barley seedlings from the treated seed arrived at maturity than from the untreated seed, and the mature plants from such treatment were more vigorous.

The control of cereal smuts by seed treatment, F. D. Fromme (*Virginia Sta. Bul. 262 (1928), pp. 16, figs. 4*).—The results are given of several years' experiments on the control of the smuts of oats, barley, and wheat.

For the control of the smuts of oats and barley, formaldehyde was found to be the most satisfactory chemical used. The hot water treatment gave complete freedom from barley smut.

For the control of stinking smut or bunt of wheat, a number of the treatments were satisfactory, the dry treatments being as effective as the wet ones. Abavit and copper carbonate were the most efficient of the dusts used in one series of experiments, and superkalimat, formaldehyde, and Uspulun were the most effective wet disinfectants.

Washing seed wheat in running water was also found an effective method of reducing smut.

Inheritance of resistance in oats to Puccinia graminis avenae, S. M. Dietz (*Jour. Agr. Research [U. S.], 37 (1928), No. 1, pp. 1–23, figs. 5*).—In experiments on rust resistance of oats, described by the author, it was found that in making crosses out of 770 pollinations no hybrids were obtained from pollinations made between 11.30 a. m. and 2.30 p. m., under field conditions in central Iowa and northern Wisconsin. Pollination at the time of emasculation resulted in some selfed seeds, whereas pollinations made from 24 to 72 hours after emasculation produced true hybrids and a percentage of fertility higher than that resulting after longer periods. Dusting the stigma with pollen produced a percentage of hybrids higher than by inserting the whole anther between the lemma and palea.

Marked hybrid vigor as expressed by yield was obtained in the F_1 generation of oat crosses. Large uredinia are said to have been directly correlated with susceptibility to the rust. Resistance to *P. graminis avenae* was found dominant and due to a single-factor difference in White Tartar×National and White Tartar×Lincoln crosses. At least 3 genetically different strains of Burt were found to breed true for susceptibility. In crosses between resistant varieties such as Green Russian×Richland and White Russian×Ruakura the F_1 plants were resistant The F_2 generation segregated and produced some plants which were more resistant than either parent.

It is considered probable that other factors were involved in the inheritance of resistance to *P. graminis avenae.*

The influence of Ustilago tritici on the physiological functions of wheat [trans. title], A. L. Kourssanow (*Rev. Gén. Bot., 40 (1928), Nos. 473, pp. 277–302, figs. 3; 474, pp. 343–371*).—Physiological peculiarities presented by wheats attacked by *U. tritici* include abnormally active respiration, transpiration, and carbon dioxide assimilation. The total of reserve carbohydrates may be slightly greater in the diseased plants. Growth during the first 20 to 25 days is increased in the infected plants.

Effect of sulfuric acid on wheat lodging due to foot rot [trans. title], E. Rabaté (*Jour. Agr. Prat., n. ser., 47 (1927), No. 7, pp. 133–135, figs. 2*).—In summation of observations and tests as far back as 1912, it is stated that the stem-base parasites *Leptosphaeria* sp. and *Ophiobolus* sp. are the determining causes of wheat foot rot, though alimentary insufficiencies (of nitrogen or phosphorus) may constitute aggravating conditions, the degree of gravity of the resulting injury depending upon the way in which these influences are combined. Sulfuric acid acts upon both determining and aggravating causes, checking the development of the parasites and conditioning for the plant a better alimentation.

Experimental studies on head smut of corn and sorghum, G. M. Reed, M. Swabey, and L. A. Kolk (*Bul. Torrey Bot. Club, 54 (1927), No. 4, pp. 295–310, pls. 5*).—The experimentation carried out during 1924–1926 with the head smut of corn and that of sorghum caused by *Sorosporium reilianum* indicated for 1925 that the corn smut would not attack sorghum. In 1926, however, evidence was obtained indicating that to some extent these smuts may both infect across.

The results are held to indicate that these smuts are physiologically distinct though not sharply limited. In each case the original host was much more severely infected than was the new host.

Attack of sugar beet and mangel-wurzel by Phoma betae [trans. title] (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 47 (1927), pp. 27, pls. 3, fig. 1*).—As a result of studies accredited to W. B. L. Verhoeven, a systematic account is given of *P. betae* (said also to be described in the literature as *Mycosphaerella tabifica*) in its relations with sugar beet and mangel-wurzel as regards symptoms, injury, control, and phenomena easily mistaken for signs or results of attack by *P. betae.*

Mercury-phenol compounds for treating seed maize, W. H. Darragh (*Agr. Gaz. N. S. Wales, 38 (1927), No. 9, pp. 672–674*).—The data from a small-scale experiment indicate that the mercury-phenol compounds may be advantageous locally in the treatment of maize seed to guard against the root and stalk rots which have been present for some years, overwintering in both soil and seed.

Cotton pathology and physiology, M. N. Walker (*Florida Sta. Rpt. 1927, pp. 38, 39*).—A preliminary report is given of studies on the relation of soil temperature to the germination of cottonseed, to the growth of cotton seedlings, and to the sore shin disease of cotton.

Soil temperature was found to exert a marked influence on the germination of cottonseed, the most rapid germination taking place between 34 and 35° C. Above 38° and at 15° germination was slowed up very greatly, and none took place at 40°. The growth of cotton was found to be little affected at temperatures between 22.5 and 35° other than the more rapid germination at the higher temperatures.

In experiments to determine the effect of soil temperature on cotton injury from Rhizoctonia, it was found that killing was high at a temperature between 15 and 30°. Above 30° killing was diminished, and none occurred at soil temperatures of 35°. In culture work with the fungus, the optimum temperature for growth was found to be about 27°. At 34.5° the growth was very weak, and none occurred at 38.5°. The lower limit for the growth of the fungus appeared to be about 9°.

Cotton wilt: A pathological and physiological investigation, D. C. Neal (*Ann. Missouri Bot. Gard., 14 (1927), No. 4, pp. 359–424, pls. 9, figs. 2; also Mississippi Sta. Tech. Bul. 16 (1928), pp. 87, pls. 9, figs. 2*).—Cotton wilt (*Fusarium vasinfectum*), widely distributed in the southern United States, is said to cause annually a loss of more than 350,000 bales, varying from year to year with changing environmental factors.

The fungus grows slowly below 10° C. (50° F.), the optimum lying about 28–30° and the maximum about 38°. It grows over a wide pH range, the best growth occurring about 3.0–5.5. The maximum growth occurred in cultures started at pH 3.5. Growth in the more acid cultures starts off slowly but tends to approach that in cultures initially less acid. Change in reaction of the culture solution occurs during growth. No correlation was made out between iron accumulation in the tissues and wilt infection. The pathogenicity of the fungus was established under certain greenhouse conditions. The toxicity of aluminum salts to cotton seedlings is not pronounced, and these salts did not increase susceptibility to *F. vasinfectum*.

Nutrition treatments apparently had no preventive effect. Potassium salts may reduce wilt damage by delaying infection and thus allowing some of the bolls to mature, especially when combined with crop rotation favoring the retention of organic soil content. An account of wilt-susceptible and of wilt-resistant cotton varieties is given. Liberal fertilization is important, and preference should be given to formulas containing from 8 to 10 per cent of phosphoric acid, 4 to 5 per cent of potash, and from 4 to 6 per cent of nitrogen.

Preliminary note on an internal boll disease of cotton in Burma, D. Rhind (*Agr. Jour. India, 22 (1927), No. 1, pp. 34–38*).—An internal disease of unripe cotton bolls is described as occurring in connection with two species of Nematospora and invariably with signs of puncture by the red bug, ***Dysdercus cingulatus***, which was experimentally proved to be intimately associated with the disease. It is considered the most serious cotton disease in Burma. The cultivation of the highly susceptible Cambodia type appears likely to become unprofitable over this area.

Gall formation on the roots of mustard due to a smut (Urocystis coralloides Rostrup), M. MITRA (*Agr. Jour. India, 23* (*1928*), *No. 2, pp. 104–106, pls. 2*).—Gall formation on roots of mustard in the village of Naranpur, near Pusa, was found to be due to a fungus which was identified as *U. coralloides*, said to be rare and only twice previously reported on cruciferous plants in Europe. The morphology of the fungus is outlined. Although the fungus, when present in the soil, can infect the plant, no spores germinated under laboratory conditions.

Blue spot of potatoes [trans. title] (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 48* (*1927*), *pp. 42, pls. 2, figs. 8*).—Studies accredited to J. O. Botjes and W. B. L. Verhoeven investigated the causation and relationships of a blue or blue-black spotting in potato tubers, which is described. This spotting renders them almost wholly unfit for eating, due to changes indicated.

It has been found that the blue-spot tubers, grown on potassium-poor soil, are themselves lacking in potassium. The addition of potassium decreased the percentage of blue spot, as did also stable manure according to its potassium content.

Blue spot could be caused artificially by dropping, shaking, or pressing the tubers, sometimes even in those from normal soils. The trouble seldom appears before the tubers are dug, but it increases with every handling after digging, or it tends to remain the same in the absence of further handling. Potassium poverty makes tubers more sensitive to injury from rough handling. The presence of considerable oxygen appears to be essential to the appearance of this coloration. When tubers are pressed and brought into an oxygen-free space no blue spot appears, but it develops later after the tubers have had opportunity to take up oxygen. Cold and corrosive salts also produce blue or black spots in the tubers. Soft potatoes show more blue spots than do hard tubers. Differences in susceptibility appear. Bravo is very susceptible, though Eigenheimer and Roode Star show very little blue spot.

A leaf adaptation conducive to mosaic resistance in the sugarcane, T. S VENKATRAMAN and R. THOMAS (*Agr. Jour. India, 23* (*1928*), *No. 1, pp. 56, 57, figs. 2*).—This article, assuming that mosaic is insect borne, describes structures presumably protecting the stomata. It suggests also other adaptations tending toward protection against the introduction of mosaic virus, as compactness and rigidity of the leaf tissues, or against the virus when introduced, as the presence of counteracting substances in the tissues.

Disease resistance in sweet potatoes, W. L. BLAIN (*Alabama Sta. Rpt. 1927, p. 17*).—Inoculation experiments, in which some 60 varieties and selections of sweet potatoes were grown in clay pots, showed that Bigwig White No. 23 was less susceptible to the black rot organism than any other variety. Nancy Hall, Porto Rico, Triumph, and Big Stem Jersey showed more or less infection in the tests. Other results are said to indicate that the varieties Gold Coin, Southern Queen, Nancy Hall, and Porto Rico are very susceptible to black rot. Dooley, Bunch Yam, and Yellow Yam seemed less susceptible, while Big Stem Jersey and Triumph were still less susceptible.

[Sweet potato disease control], J. A. MCCLINTOCK (*Tennessee Sta. Rpt. 1927, p. 36*).—The author states that tests of various organic mercury compounds for the treatment of seed sweet potatoes at bedding time gave no indication that any of the materials were superior to corrosive sublimate for controlling sweet potato diseases in the plant beds.

Report of the Tobacco Experiment Station, W. B. TISDALE (*Florida Sta. Rpt. 1927, pp. 98–103, figs. 3*).—Continued tests were made of selections and hybrids of different types of cigar wrapper tobacco for resistance to black shank, *Phytophthora nicotianae* (E. S. R., 56, p. 548). Some selections and certain hybrids were found to be from 90 to 98 per cent resistant. Commercial tests were made of 4 types of tobacco planted in soil infected with black shank, and all proved resistant. Crosses made between types of partially resistant tobaccos were found in the F_2 generation to be resistant where the parent plants were resistant.

Tests of 18 types of bright tobacco showed little difference in resistance to black shank.

Notes are given on the occurrence of Alternaria leaf spot, wildfire, sore shin, root knot, and mosaic of tobacco. The pumpkin bug (*Nezara viridula*) is suspected of acting as a carrier of mosaic. The disease was also found to be carried from plant to plant by laborers.

Black root-rot of tobacco in New South Wales, L. F. Mandelson (*Agr. Gaz. N. S. Wales, 38 (1927), No. 7, pp. 523–531, figs. 4*).—This article briefly describes the relationship of the tobacco black root rot causal fungus (*Thielavia basicola*) to the disease and emphasizes the effect of weather conditions upon the development of black root rot, stating that the phenomenal dwarfing of tobacco in the field during the season should be attributed largely to the effects of the black root rot disease during a season particularly favorable to its attack.

Anthracnose of lettuce, W. A. Birmingham (*Agr. Gaz. N. S. Wales, 38 (1927), No. 6, pp. 487–490, fig. 1*).—Lettuce anthracnose (*Marssonina panattoniana, M. perforans*), previously known in Germany, France, the Netherlands, Italy, England, and the United States, is said to have been recorded for the first time in New South Wales as the result of the examination in September, 1926, of lettuce plants from the Goulburn district.

Spotted wilt in tomatoes, R. J. Noble (*Agr. Gaz. N. S. Wales, 39 (1928), No. 1, pp. 59–63, figs. 3*).—Tomato spotted wilt is said to have been recorded for Victoria in 1919, reported for South Australia and Western Australia, and known in New South Wales since 1920. Streak or winter blight of tomatoes in Canada and the United States resembles in some ways the locally occurring spotted wilt, which is, however, distinct from the wilts due to *Fusarium* sp., *Verticillium* sp., *Bacillus solanacearum*, or *Phytophthora infestans*. No commercial tomatoes are resistant. Observations and tests are briefly reported. Preliminary tests with capsid bugs transferred from diseased to healthy plants resulted in the development of the disease, and the evidence showed this disease to belong to the virus group. The importance of removing diseased plants immediately is apparent.

Tomato diseases, G. H. Berkeley (*Canada Dept. Agr. Bul. 51, n. ser., rev. ed. (1927), pp. 17, pls. 3*).—This is a revision of Bulletin 51 (E. S. R., 56, p. 353).

[Tomato breeding for disease resistance], S. H. Essary (*Tennessee Sta. Rpt. 1927, p. 29*).—Selection work was undertaken with varieties of tomatoes to test their resistance to Septoria and Alternaria leaf spot diseases, and some apparently resistant plants were secured for further trial. Spraying was found partially effective in controlling the diseases. The variety Marglobe, a wilt-resistant tomato, was found to be the best of the red or canning types tested. Good results were secured with a pink wilt-resistant variety, and selections for leaf spot resistance were made with this strain.

Burr-knot or stem-tumour of quince and apple trees, W. A. Birmingham (*Agr. Gaz. N. S. Wales, 38 (1927), No. 12, pp. 941–943, figs. 2*).—A summary of evidence states that it has not been shown that burrknots on quince or apple trees are contagious or due to a parasitic organism, that they are in any way detrimental to the tree, or that they are in character other than aggregations of dormant aerial or adventitious roots.

Apple and pear scurf [trans. title] (*Verslag. en Meded. Plantenziektenkund. Dienst Wageningen, No. 50 (1927), pp. 24, pls. 3, figs. 2*).—Information accredited to I. P. Hus, J. Adema, and T. J. de Vin is presented in systematic form regarding scurf in apple, due to *Fusicladium dendriticum*, and in pear, due to *F. pirinum*.

Report on "box scald" in western shook, D. F. Fisher (*Timberman, 29 (1927), No. 1, p. 170*).—Box scald, an injury to apples and pears in boxes associated with pressure against the container, particularly veneered lids, is described. Following rainy weather in the fall of 1924, this injury was unusually prevalent in the Hood River Valley, and studies indicated that the injury was confined to apples in boxes made of Douglas fir. In 1926, after extensive wetting of boxed apples, the trouble was found to be confined to apples in the bottoms of the boxes, a brown area forming where contact was made with the Douglas fir container. In February, 1927, the same injury appeared extensively on apples in both the top and bottom layers of packed boxes in cold storage, and the matter assumed commercial importance. An investigation was instituted, the results of which are summarized in the present article.

The damage occurred only in the case of apples in contact with Douglas fir lids, regardless of the paper wrappings and the heavier paper box linings. Experimentation indicated that the injurious factor is normally present in Douglas fir wood, and that the injury is not due to anything incident to the veneering process. The more resinous boards produced the worst injury, which practically occurred exclusively in case of the heartwood, no other kind of wood commonly used for this purpose producing the injury. Extracted resin produced the injury, in severe form, but only in case of Douglas fir. Both hot and cold water extracts of Douglas fir produced the injury when in contact with apples in a dish, water alone causing no injury. The resin itself is only slightly water soluble. The conclusion is reached that Douglas fir contains a water-soluble factor other than resin, but associated with resin, that is injurious to apples. Experimental work is projected to determine the specific chemical substance causing the injury.

The practical remedy is thought to be total avoidance of Douglas fir as a wood for making apple and pear containers.

Apple scab and apple blotch (*Ohio Sta., Dept. Hort., Expt. and Research Work, 1926–27, p. 9*).—The outstanding lesson of experiments for the control of apple scab and apple blotch is said to be that both diseases can be successfully controlled by much weaker sprays than those previously recommended, provided the spraying is done carefully and thoroughly. Bordeaux mixture sprays of one-fourth to one-third the formerly recommended strengths gave satisfactory control of these diseases, with greatly lessened injury to fruit and foliage.

Lime-sulfur sprays, both from the commercial solution and from dry or powdered forms, showed superior fungicidal properties, and the apples were smoother and more glossy than where copper sprays were employed. Lime-sulfur sprays are said to have given excellent control of apple blotch.

Spray solutions and the control of apple scab, O. Butler and W. L. Doran (*New Hampshire Sta. Tech. Bul. 36 (1928), pp. 15, fig. 1*).—As a result of their investigations the authors claim that lead arsenate, while uninjurious to the apple, does not control scab satisfactorily. Lime-sulfur solution was found to control scab under conditions favorable for its action. Lime sulfur and lead arsenate gave satisfactory control but caused more or less russeting of the fruit. Lime sulfur and lime arsenate gave satisfactory control of scab, with little if any russeting of the fruit.

Kieffer pear seedlings and fire blight resistance, H. E. Thomas (*Bul. Torrey Bot. Club, 54 (1927), No. 7, pp. 583–585*).—The Kieffer pear, a hybrid between *Pyrus serotina culta* and *P. communis sativa* (the latter parent representing the more desirable fruit characters and the former showing high resistance to fire blight, *Erwinia amylovora*), is said to be intermediate as regards fruit quality and blight resistance. Further selection was attempted from hybrids of the Kieffer type. An effort was made, by repeated inoculation, to eliminate at an early age those individuals which were susceptible to blight. The results are outlined. Support was given to the expectation that resistant individuals of a population obtained might show the desirable tree and fruit characters of the *P. communis* parent.

Root-knot, J. R. Watson (*Florida Sta. Rpt. 1927, pp. 45, 46*).—In continuation of experiments on nematode control (E. S. R., 45, p. 357), the author reports that plats treated with calcium cyanide in comparison with those treated with sodium cyanide and ammonium sulfate indicated that the latter treatment was preferable in spite of the greater expense.

In an experiment with calcium cyanide on peach trees infested with root knot nematodes, a lot of treated trees were removed and the roots examined. The trees grown on the treated plats were appreciably freer from root knot and of a larger size than the untreated trees. The best results seemed to have been secured where the plats received 1,000 lbs. of calcium cyanide per acre per year in four applications (March, May, July, and September). These trees showed less root knot than those in which the same amount of calcium cyanide was applied in 1, 2, and 3 applications per year. The trees which received 1,500 lbs. per acre were injured by the material.

The inheritance of anthracnose resistance, A. S. Colby (*Jour. Heredity, 19 (1928), No. 8, pp. 377–382, figs. 2*).—Studies at the Illinois Experiment Station upon the anthracnose resistance of raspberry varieties and seedlings, obtained in crosses between varieties differing in susceptibility to this disease, showed in each progeny a number of promising individuals which combined resistance with other good characters. The self-pollination of Quillen, a markedly anthracnose-resistant black raspberry, in fact the only variety found with any completely healthy plants, yielded seedlings 30 per cent of which surpassed the parent in resistance. Quillen proved an excellent source of resistance in various crosses. Reciprocal crosses were successfully accomplished between the black and red raspberry.

The control of mosambi (Citrus aurantium) gummosis, M. N. Kamat (*Agr. Jour. India, 22 (1927), No. 3, pp. 176–179, pls. 2*).—A gumming disease of *C. aurantium*, almost invariably occurring at the collar, traveling upward (as evidenced by a longitudinal peeling or breaking of the bark with exudation of amber colored gum) and preceding the decline or in some cases the sudden death of the tree, is described. Experimentation was carried out involving the removal of the bark and the application of a fungicide, either crude carbolic acid with an equal amount of water or a Bordeaux paste made up of 1 lb. of copper sulfate, 2 lbs. of unslaked lime, and 16 lbs. of water. Both fungicides gave very satisfactory results, stopping the exudation, arresting the disease, and promoting healing and callus formation. Both the number of plants treated and the period of time allowed were considered sufficient to warrant faith in the reliability of the final results.

A remedy for a die-back disease of orange trees, D. L. Sahasrabuddhe (*Agr. Jour. India, 22 (1927), No. 2, pp. 114–117, pls. 2*).—A die-back of orange trees ascribed to the close nature of the soil was remedied very decidedly by trenching on one, two, or three sides of each tree and filling in this trench with stones, tiles, and the original soil, sometimes mixed with manure.

Splitting of oranges, A. F. Camp (*Florida Sta. Rpt. 1927, pp. 50 52*).—In the fall of 1926 the author made surveys and studies of a type of fruit splitting of oranges which was particularly serious on the variety Valencia. The splitting is said to be longitudinal, starting at the blossom scar and frequently reaching almost to the stem. It is held to be quite distinct from that accompanying ammoniation, since the oranges are normal as to size and texture and split longitudinally, while the ammoniated fruit is small, has a hard rind, and frequently splits transversely.

In a group of trees counts were made of the fruits, and it was found that in many cases more split fruits occurred on the trees than normal ones. The splitting was believed to be worse in the "ridge" area than in other areas, and seemed to be correlated with the distribution of the light sandy soil common to much of that area. Some severe cases of splitting, however, were found on much heavier soils.

The rind of the fruits, in groves where splitting was taking place, was found to be under a high tension, due either to shrinking of the rind or to an abnormally rapid swelling of the pulp.

The common remedy of plowing close to the trees to cut off feeding roots is believed to be of doubtful value.

Pecan scab and its control by means of sprays, W. L. Blain (*Alabama Sta. Rpt. 1927, pp. 17, 18*).—The author reports having isolated the pecan scab organism from the varieties Alley, Pabst, and Schley. A temperature of 23° C. was found to be best for the growth of the organism in pure cultures. It is claimed that pecan scab can be controlled rather readily by the use of a 3–3–50 Bordeaux mixture in a machine of adequate capacity and power to throw a fine spray over both sides of the leaves, twigs, and branches of all parts of the tree. The author suggests that the first application should be made as soon as pollination occurs, followed by at least two more applications at 3-week intervals.

A short note on the foot-rot disease of pan in the Central Provinces, J. F. Dastur (*Agr. Jour. India, 22 (1927), No. 2, pp. 105–108*).—Pan or betel (*Piper betle*), said to be important in many districts of the Central Provinces, is cultivated in gardens usually so damp as to favor the development of any organism present. In 1923 and thereafter, a disease was reported as causing severe losses, the wet months especially favoring the injury. The onset and progress of the disease are described. Diseased and dead parts of the plants show the acervuli of the Colletotrichum stage, or of the Gloeosporium stage of *Glomerella cingulata*, the perfect form having been found both in cultures and on dead plants. Usually Colletotrichum and Gloeosporium have been isolated from the diseased plants, but these fungi failed to produce the disease on healthy plants. In some cases, *Rhizoctonia destruens* has been isolated along with Colletotrichum and Gloeosporium, but the real cause of the disease in epidemic form is supposed to be a Phytophthora. In culture media the perfect stage of the fungus has been obtained, and the oospores resemble, in size and shape, those of *P. parasitica* as found on *Ricinus communis* and *Vinca rosea*. The presence of the Phytophthora is not easily to be detected in the dead or dying plants but only in the healthy or recently infected tissues. *Glomerella cingulata* then follows in the wake of Phytophthora and spreads rapidly in the dead and dying parts.

Preventive measures, as suggested and as partly tried, are detailed. Preliminary experiments were encouraging.

The x-bodies in the cells of dahlia plants affected with mosaic disease and dwarf, B. Goldstein (*Bul. Torrey Bot. Club, 54 (1927), No. 4, pp. 285–293, pls. 3, figs. 2*).—"A preliminary study of the diseased dahlia plants in and about

New York City indicates the existence of a group of diseases which closely resemble that group of the virus diseases loosely characterized as the degeneration diseases of potatoes. I have studied cytologically thus far two of these disease types which I characterize as 'dwarf' and 'mosaic.'" These two types are described.

It is claimed that a cytological study of the growing points shows that the intracellular bodies associated with tobacco, with corn mosaic, with a Hippeastrum mosaic, with the wheat rosette disease, and with the Fiji disease of sugar cane are also present in the dahlia plants in question, and that these intracellular bodies resemble in many respects those associated with the mosaic disease of tobacco and of *Solanum aculeatissimum*, which the author has previously described (E. S. R., 59, p. 448) and has referred to as the x-bodies. "The mosaic leaves that show mottling are thus far the only ones in which I have found these bodies. The x-bodies found in these plants are notably amoeba-like in appearance."

The author has suggested that these bodies may be plastic enough to pass through the pores of antibacterial filters, stating that there have often been found on the margins of the sections nuclei representing very dense protoplasm. The x-bodies are said to be definite entities in the cells of diseased regions of diseased plants, and show by their appearance in the cells that they can not be considered simple degeneration products of the host cell or cell nucleus.

The prohibition of the importation of elms and the new disease, W. R. DAY (*Quart. Jour. Forestry, 21 (1927), No. 2, pp. 123–129*).—Information is given regarding the disease of elms, somewhat obscure as to origin, which was observable in the Netherlands, Belgium, and northern France in 1918 and by 1926 had become widespread throughout western Europe, affecting at the time of this account *Ulmus campestris latifolia, U. campestris suberosa, U. campestris aurea, U. monumentalis, U. hollandica, U. rupelli, U. americana*, and *U. montana*.

Mortality among oaks, L. S. OSMASTON (*Quart. Jour. Forestry, 21 (1927), No. 1, pp. 28–30*).—Mortality among oaks on areas indicated is ascribed to defoliation by caterpillars, oak mildew (*Microsphaera quercina*), honey fungus (*Armillaria mellea*), and adverse silvicultural factors, as soil drought.

White pine blister rust reaches Idaho and Oregon (*Timberman, 29 (1927), No. 1, pp. 166, 168, figs. 2*).—History, conditions, and prospects regarding white pine blister rust in the Northwest were discussed at the annual meeting of the White Pine Blister Rust Conference held at Portland, Oreg., November 4, 1927. Outstanding facts included spread of the rust, which reached northwestern Oregon, northeastern Washington, and northern Idaho during the summer, and the development of cheaper methods of currant eradication. The year 1927 was very favorable to the spread of the rust.

Eradication costs over any large area varied, it is stated, from $1.25 to $2.50 per acre. A hastened control program was discussed.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The protection of woodlands by natural as opposed to artificial methods, G. W. ST. CLAIR-THOMPSON (*London: H. F. & G. Witherby, 1928 pp. 223, figs. 12*).—In addition to other data, chapter 1 includes an account of the origin and general control of woodland pests; chapter 2 deals with forest birds; chapter 3 with forest animals; and chapter 4 includes a discussion of biological control. The second of the five appendixes deals with insects; the third with birds; the fourth with costs of protection from rabbits and hares, of deer fencing, and of nesting boxes; and the fifth with diagrams. A list of 60 references is included.

Game laws for the season 1928–29: A summary of the provisions of Federal, State, and Provincial statutes, F. L. EARNSHAW (*U. S. Dept. Agr., Farmers' Bul. 1575 (1928), pp. II+46*).—This is the twenty-ninth annual summary of the Federal, State, and Provincial statutes relating to game (E. S. R., 58, p. 56).

Directory of officials and organizations concerned with the protection of birds and game, 1928, compiled by T. DENMEAD and F. G. GRIMES (*U. S. Dept. Agr., Misc. Pub. 30 (1928), pp. 12*).—This is the twenty-ninth annual edition of the directory (E. S. R., 58, p. 252).

Birds and their attributes, G. M. ALLEN (*Boston: Marshall Jones Co., 1925, pp. XIII+338, pls. [34], figs. [7]*).—The chapters of this work consist of a series of lectures originally prepared under the auspices of the New England Bird Banding Association to serve as an introduction to a general survey of birds, their structure, habits, and relations to man.

A taxonomic review of the American long-tailed shrews (Genera Sorex and Microsorex), H. H. T. JACKSON (*U. S. Dept. Agr., Bur. Biol. Survey, North Amer. Fauna No. 51 (1928), pp. VI+238, pls. 13, figs. 24*).—In a brief introduction to this work the author deals with the distribution and habitat, habits, food and economic status, young, weight, etc., of these shrews. This is followed by an account of the family Soricidae, including the subfamilies, pelages and molts, variations, history, list of generic names used for American long-tailed shrews, key to genera and subgenera of American long-tailed shrews, and a list of American genera, species, and subspecies of long-tailed shrews, with type localities. The genus Sorex, with three subgenera, is then dealt with, followed by an account of the genus Microsorex and an 8-page list of the literature cited.

Index of entomological literature, W. HORN and S. SCHENKLING (*Index Litteraturae Entomologicae. Berlin-Dahlem: Walther Horn, 1928, ser. 1, vol. 2. pp. 353–704, pl. 1*).—This second volume (E. S. R., 59, p. 853) includes the literature arranged by authors from Ferrill to Leconte.

Studies in breeding insects throughout the year for insecticide tests, I–III, A. G. GRADY (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 598–612, fig. 1*).—Three papers are presented, as follows:

I. *House flies (Musca domestica)* (pp. 598–604).—The author has developed a method for year-round rearing of large numbers of house flies for use in insecticidal tests. The equipment consists of an inexpensive insectary, breeding cages, rearing jars, and stock cages. As a result of the procedure described, large cultures of flies of high vitality can be developed as easily in winter as in summer.

II. *Leather beetles (Dermestes vulpinus Fab.)* (pp. 604–608).—This second contribution deals with the hide beetle, which has been used with good results for certain kinds of insecticidal experiments. This beetle can be reared simply and dependably in large numbers throughout the year. Compared with some insects it is very resistant to certain toxic compounds and serves very well in measuring their insecticidal efficiency.

III. *Roaches, clothes moth, weevils* (pp. 608–612).—The methods employed in rearing these insects are described.

Is there any definite basis for forecasting insect outbreaks and ascertaining if control measures are practicable? A discussion from a research standpoint, W. E. HINDS (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 559–563*).—This is a contribution from the Louisiana Experiment Stations.

[Entomological studies at the Alabama Station] (*Alabama Sta. Rpt. 1927, pp. 23–25*).—In a study of the banded cucumber beetle by J. M. Robinson, 31 days were found to be required for the completion of its life history, the average incubation period being 3.8 days, larval period 15 days, and prepupal period 3 days.

In boll weevil control work with calcium arsenate conducted by Robinson on heavy clay, a gain of 90 lbs. of seed cotton per acre was obtained on one plat and a gain of 150 lbs. of seed cotton on another plat (newly cleared land) as a result of dusting, or a gain insufficient to make dusting profitable. On the black belt soil where there was a 10 per cent infestation on June 25, a gain of 300 lbs. of seed cotton per acre was obtained on plats dusted 9 times during the season, commencing on June 25, three of which were washed off by rain within 24 hours after application.

In the boll weevil hibernation study by Robinson, 13 of the 3,804 weevils placed in hibernation cages in the fall of 1926 emerged in the spring of 1927.

Robinson and F. S. Arant report that the cotton flea hopper was present in large numbers during July and August on both the station and Whatley farms near Opelika, considerable damage having been done to cotton early in the season. Applications of from 6 to 10 lbs. of sulfur per acre at 5-day intervals reduced the infestation and materially increased the yield, good top crops having set at both places. The results obtained from the application of sulfur and calcium arsenate (equal parts) at the rate of 10 to 12 lbs. per acre indicated that it might be valuable in combating weevils and hoppers combined. Nicotine dust and calcium arsenate (equal parts) gave substantial gains. A table is included which shows the average number of adult and nymph cotton flea hoppers per sweeping and the seed cotton per acre.

The oriental fruit moth (*Laspeyresia molesta* Busck) was found by H. G. Good to have four distinct generations per year in the State. Culled fruit, which composed 25 per cent of the crop, had an infestation of 3.7 per cent.

The use of calcium arsenate against the southern corn root worm was found by Arant to be effective in killing the adults.

Report of the entomologist, J. R. Watson (*Florida Sta. Rpt. 1927, pp. 43–49*).—An account is first given of work with the green citrus aphid (*Aphis spiraecola* Patch), a study of the life history of which was carried on by R. L. Miller at Lake Alfred in the center of the citrus belt and by A. N. Tissot at Gainesville on the extreme northern edge of the belt. A marked difference was detected, the records showing that at Lake Alfred, except for a few brief periods when it was too cold, the weather during late fall and winter, from October 15 to March 1, was the most favorable of the whole year for the development of the aphids, while during this period at Gainesville both reproduction and growth took place the slowest of any period during the entire year. This is considered to explain why the aphid has never been so injurious in the northern part of the belt and to indicate that it never will be except perhaps during exceptionally warm winters. The critical temperature appears to be around 72° F. Eggs laid on sand pears from November 15 to December 18 were observed by Tissot to begin to hatch on January 18, this being the first time eggs have been observed to hatch in Florida. It is pointed out that the successful hatching of eggs during the winter of 1926–27 shows plainly that cold will not exterminate the aphids. The observations indicate that severe outbreaks of the aphids will always be confined to the early spring, and especially to seasons when a warm, moist winter, free of destructive freezes, is followed by a cold or dry spring which extends the flush of growth over an abnormally long period.

The biology of the predatory enemies of this aphid has been worked out thoroughly, and data obtained upon the efficacy of each class of predators, which at times took 10 per cent of the entire number of aphids per day on the trees observed. These predators were found to be highly attacked, especially by Hymenoptera, fungi, and bacteria.

As regards control, it is said that the season's experience has emphasized the efficacy of a thorough clean-up of the aphids during the winter and the hastening, by fertilization and cultivation, of the spring flush of growth. Among the numerous insecticides tested two seem to possess advantages over a 3 per cent nicotine sulfate-lime dust heretofore found most effective. It was found by Miller that by making up the dust with sulfur substituted for half the hydrated lime a very light dust was obtained that worked well in the dusters. It appeared to be even more effective than that in which lime only was used as a carrier, and controlled rust mites and red spiders at the same time. Under favorable atmospheric conditions of warm, calm weather, a 2 per cent dust was effective, and this reduced the cost considerably. The other promising insecticide was a very finely divided tobacco dust analyzing 2 per cent nicotine.

A brief reference is made to root knot, which is noted on page 155.

The flower thrips infesting citrus blooms were too few in numbers to test control measures, but a heavy infestation on strawberry blossoms afforded an opportunity to test various insecticides. Of these, Derrisol (1:800) was almost a complete failure, only about 10 per cent of the insects being killed. Nicotine sulfate spray (1:800) killed nearly 90 per cent. Even better results were obtained by dusting the plants with a mixture of equal parts of sulfur and finely ground tobacco analyzing 2 per cent nicotine. This not only killed the thrips in the blossoms but acted as a repellant and delayed reinfestation for several days, and had the additional advantage of controlling red spiders.

Reference is made to the introduction from Cuba of a tachinid parasite (*Lixophaga* sp.) of the sugar cane borer.

The report concludes with an account of pecan insect investigations by F. W. Walker. The shuckworm (*Laspeyresia caryana* Fitch), formerly considered of minor importance, became a serious pest of the pecan, if not its most important enemy in the Monticello region. An average of nearly 75 per cent of the husks gathered in the spring showed infestation by it. Experiments conducted with a view to determining whether turning under of the fallen husks would be of any benefit in controlling this pest showed that 51 per cent emerged from the surface, 4.75 from a 1- to 4-in. covering of sandy loam, 7 per cent from a 1-in. clay covering, and none emerged from 2- to 4-in. of clay covering. Thus, the results indicate that a good control can be secured by plowing in the husks, especially in the heavy soils. An experiment is under way to determine the percentage of nuts destroyed by the shuckworm. The nuts picked up from 10 trees showed 59.34 per cent to have been injured by shuckworms, 10.46 by the weevil, 3.69 by the nut case-bearer, and 0.07 by squirrels. No injury was detected in 26.43 per cent of those that had dropped.

Larvae of the spring brood of nut case-bearers were found entering the nuts on May 13, the percentage of infestation during the year being low.

In work with the larvae of the leaf case-bearer sprayed trees showed a control of from 80 to 90 per cent over the check, depending upon the strength of the arsenate used.

Numerous egg punctures of the tree cricket (*Oecanthus angustipennis* Fitch) were found in the small branches of the pecan. In some cases the twig had died above the puncture, although in most cases this does not occur and a long scar is left which lasts for a period of at least three years before healing over.

Biological survey of the Mount Desert region.—Part I, The insect fauna, C. W. JOHNSON (*Philadelphia: Wistar Inst. Anat. and Biol., 1927, pt. 1, pp. 247, pl. 1*).—In this volume, which is part 1 of a survey conducted by W. Procter, the author records the insect fauna of Mount Desert Island by order and family.

[Report on entomology at the Tennessee Station], S. MARCOVITCH (*Tennessee Sta. Rpt. 1927, pp. 31–33*).—The investigations on sodium fluosilicate (E. S. R., 59, p. 456) were continued during the year.

A study of the repellent effect of sodium arsenite was confirmed with *Feltia ducens*, a 1 to 56 mixture having given a kill of 57 per cent in 72 hours. Sodium fluosilicate, however, showed a mortality of 88 per cent.

Several of the more abundant pests of the year mentioned are the sweet potato flea beetle, larvae of the banded flea beetle on sweet potato, spotted cucumber beetle, and fall army worm.

Report of the occurrence of insect pests on crops in England and Wales for the years 1925, 1926, and 1927, J. C. F. FRYER (*[Gt. Brit.] Min. Agr. and Fisheries, Misc. Pub. 62 (1928), pp. 47, pl. 1, fig. 1*).—This is a summary of information on the occurrence of the more important insects during the years 1925 to 1927, inclusive, arranged under the headings of crops attacked. In Appendix 1 the periodical fluctuations in numbers of the plum aphid (*Anuraphis padi*), rosy apple aphid, woolly apple aphid, flea beetles (*Phyllotreta* spp.), leather jacket (*Tipula* sp.), frit fly (*Oscinis frit*), mangold fly (*Pegomyia hyoscyami*), and winter moth (*Cheimatobia brumata*) are charted. Appendix 2 consists of a list of the more important plant pests, exclusive of forestry pests.

Animal pests of useful plants, II, H. BLUNCK, F. BODENHEIMER, C. BÖRNER, K. FRIEDERICHS, F. HEIKERTINGER, G. JEGEN, R. KLEINE, and W. SPEYER, rev. by L. REH (*Handbuch der Pflanzenkrankheiten, begründet von P. Sorauer, V. Band, 1. Hälfte, Tierische Schädlinge an Nutzpflanzen, II. Teil. Berlin: Paul Parey, 1928, 4. ed., vol. 5, pt. 1, pp. 416, figs. 185*).—This contribution (E. S. R., 55, p. 242; 56, p. 355) deals with the Diptera, Coleoptera, and Hymenoptera of economic importance.

Important cotton insects of central Peru, W. E. HINDS (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 545–551*).—This is an account of insects observed in the Canete Valley, located about 100 miles south of the city of Lima, during a 6-weeks investigation of cotton insect problems. The insects considered include cotton leaf worms, the Peruvian cotton square weevil (*Anthonomus vestitus* Boh.), boll boring lepidopterans, and cotton plant lice.

Controlling the insect pests of strawberries, L. HASEMAN (*Missouri Sta. Circ. 168 (1928), pp. 12, figs. 8*).—This is a practical discussion.

Studies in insecticidal activity, I–IV, C. H. PEET and A. G. GRADY (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 612–625*).—Four papers are presented, as follows:

I. *Testing insecticides against flies* (pp. 612–617).—The authors have attempted to establish the testing of household insecticides on a sound and comparable basis. The necessity for the reduction of variables to a minimum is pointed out, and it is suggested that a definite standard be adopted for time, temperature, humidity, insecticide concentration, spray concentration, pressure in sprayer, air condition, angle of spray, kind of insect, and condition of insect. Emphasis is placed upon the fact that many tests and extended observations are necessary, and explicit directions for conducting tests upon flies are given.

II. *Direct contact sprays* (pp. 617–620).—The authors developed a standardized method for testing contact sprays, descriptions being given of the test cages employed and the exact procedure followed.

III. *Testing insecticidal fumigants, i. e., insecticides which function in the vapor phase* (pp. 621–623).—The authors describe an exact procedure for the testing of insecticidal fumigants for use in storage warehouses, grain elevators, etc.

IV. *Testing insecticides as insect repellents and moth killers* (pp. 624, 625).—Moth-proofing and moth-killing tests are reported upon, a detailed description being given of the procedure followed in testing compounds recommended for either purpose.

Reports of work of the laboratory for the study of poisonous substances of the Plant Protection Department of the People's Commissariat of Agriculture, R. S. F. S. R., I, II [trans. title] (*Trudy Nauch. Issledov. Lab. Otravl. Veshch.* (*Rpts. Work Lab. Study Poison Subst., Plant Protect. Dept. People's Commis. Agr. R. S. F. S. R.*), *1927, Nos. 1, pp. 90, figs. 18; 2, pp. 106, figs. 2*).—The insecticidal contributions presented in the first part include the following: A Study on the Toxicity of Calcium Arsenate and Arsenite, by I. A. Parfent'ev (Parfentjev) (pp. 8–16, Eng. abs. p. 16); Sodium Arsenite as Insecticide, by N. S. Vyshelesskai͡a (Vyshelessky) (pp. 16–21, Eng. abs. p. 21); Insecticides (Combinations of Arsenic and Carbon Disulfide) as Stimulators of the Growth of Plants, by Z. V. Ivanova-Aleksandrovskai͡a (Ivanov-Alexandrovsky) and I. A. Parfent'ev (pp. 21–33, Eng. abs. p. 33); First Use of Airplanes in Applying Insecticides in R. S. F. S. R., by G. I. Korotkikh (Korotkich) (pp. 33–72, Eng. abs. p. 72); and On the Behavior of Locusts amidst the Dusted Plants (p. 87, Eng. abs. p. 87) and Experiences on the Adhesive Property of Insecticides and Their Admixtures (pp. 88–90, Eng. abs. p. 90), both by N. S. Vyshelesskai͡a.

Part 2 contains the following papers: Experiments in Controlling *Gerbillus meridianus* Pall. by means of Poisoned Baits and Bacterial Infection in the Dengiz region, Bukeev district, Province of Uralsk, by I. I. Traut and N. S. Khitrov (Chitrov) (pp. 1–13, Eng. abs. p. 13); Testing the Control of Ground Squirrels with Poisoned Baits, by I. I. Traut and N. M. Semenov (pp. 14–82, Eng. abs. pp. 81, 82); and A Study of Toxic Action of Arsenic Compounds on Rodents, by I. A. Parfent'ev (Parfentjev) (pp. 82–106, Eng. abs. pp. 105, 106).

Progress report on the use of petroleum oil as an insecticidal spray, E. R. de Ong (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 525–529*).—This is a contribution from the California Experiment Station in which a summary is given of established field practices in the use of petroleum oil sprays for both citrus and deciduous trees, together with data covering the species of insects concerned and the dosages used.

Studies in entomogenous fungi, I–XII, T. Petch (*Brit. Mycol. Soc. Trans., 7 (1921), pt. 1–2, pp. 89–132; pt. 3, pp. 133–167, pls. 3; 9 (1923), pt. 1–2, pp. 108–128, pl. 1, figs. 5; 10 (1924), pt. 1–2, pp. 28–80, pls. 3, figs. 4; 10 (1925), pt. 3, pp. 152–201, pl. 1, figs. 2; 10 (1926), pt. 4, pp. 244–271, fig. 1; 11 (1926), pts. 1–2, pp. 50–66, pl. 1, fig. 1; 3–4, pp. 251–266, figs. 3; 12 (1927), pt. 1, pp. 44–52 pl. 1*).—The first and second contributions deal with The Nectriae Parasites on Scale Insects (pp. 89–167), the third with Torrubiella (pp. 108–128), the fourth with Some Ceylon Cordyceps (pp. 28–45), the fifth with Myriangium (pp. 45–80), the sixth with Cephalosporium and Associated Fungi (pp. 152–182), the seventh with Spicaria (pp. 183–189), Additions and Corrections (pp. 190–201), the eighth with Notes on Beauveria (pp. 244–271), the ninth with Aegerita (pp. 50–66), the tenth with *Verticillium* spp. (pp. 251–254), the eleventh with *Empusa lecanii* Zimm. (pp. 254–258), Additions and Corrections, II (pp. 258–266), and the twelfth with *Peziotrichum lachnella, Ophionectria coccorum, Volutella epicoccum* (pp. 44–52).

Termites of the Belgian Congo and the Cameroon, A. E. EMERSON (*Bul. Amer. Mus. Nat. Hist., 57 (1928), Art. 7, pp. 401–574, pls. 19, figs. 103*).—This account includes a bibliography of 15 pages.

The Fulgoridae or plant-hoppers of Mississippi, including those of possible occurrence; a taxonomic, biological, ecological, and economic study, H. L. DOZIER (*Mississippi Sta. Tech. Bul. 14 (1926), pp. 152, figs. 35*).—This is a synopsis which includes biological and economic information on the Fulgoridae of Mississippi. The keys presented are for the forms known to inhabit the southern United States, including four new species. Mention is made of several members of the family, including the sugar cane leafhopper (*Perkinsiella saccharicida*), the corn delphacid *Peregrinus maidis*, and the cranberry toad bug (*Phylloscelis atra*), that are of particular economic importance. Aside from these species, little is known of the life history and habits of members of the family.

The life history of Erythroneura ziczac Walsh (Homoptera, Cicadellidae), V. M. FAIRBAIRN (*Jour. Kans. Ent. Soc., 1 (1928), No. 4, pp. 79–84*).—An account of biological studies of this leafhopper, which has a special preference for Boston ivy followed by Virginia creeper and grape.

Beet leafhopper, Eutettix tenellus (Baker), does not occur in the Argentine Republic, H. H. P. SEVERIN and C. F. HENDERSON (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 542–544*).—This is a contribution from the California Experiment Station in which it is shown that the leafhopper occurring in Argentina and probably mistaken for the beet leafhopper is *Aceratogallia sticticollis*.

The potato leafhopper as a bean pest in Ohio, D. M. DELONG (*Ohio Veg. Growers' Assoc. Proc., 13 (1928), pp. 76–82*).—A report of observations and experiments in the field during 1926 and 1927, with special reference to the stringless green-pod bean plant as a host. The studies are said to have revealed four distinct broods of these leafhoppers during the season, with one complete generation, a second almost complete, a partial third, and a smaller partial fourth generation. The generations were found to overlap greatly, and there was no definite break in infestation upon bean plants in the field at any particular time except when the beans began to age and the hoppers consequently sought younger plants for feeding or egg deposition.

Applications of a 40 to 50 per cent calcium cyanide gave most satisfactory results as a dust, and no chemical injury was observed during these applications. As a spray the most satisfactory results were obtained both seasons by the use of pyrethrum extracts. The oleoresin of pyrethrum extract, used for the Japanese beetle, proved very satisfactory and can be used for the leafhopper at dilutions as high as 1 to 300.

The biology of apple aphids, F. H. LATHROP (*Ohio Jour. Sci., 28 (1928), No. 4, pp. 177–204, figs. 4*).—This is a report of studies which deal particularly with the rosy apple aphid, the apple grain aphid, and the apple aphid, all three of which winter in the egg stage upon apple.

Studies on the resistance of apple to the woolly aphis (Eriosoma lanigerum Hausm.), R. LE PELLEY (*Jour. Pomol. and Hort. Sci., 6 (1927), No. 3, pp. 209–241, pl. 1*).—Tests conducted of commercial rootstocks showed 1 out of 18 varieties of stock tested to be more resistant than all the others, but no further definite grouping according to degrees of resistance was found possible. "The preliminary results from artificial infections of 15 commercial scion varieties show that none of them is immune or highly resistant. Four other varieties reputed to be resistant were tested. First infections on maiden trees, prepared for the purpose of testing whether there is interaction between stock and scion with respect to woolly aphis resistance, show no definite results in favor of belief in such interaction, but rather indicate the probability that if there is influence in this respect it is slight. Tests of seedlings derived from crossing Northern Spy with susceptible varieties have shown that the factor or factors which determine immunity are inherited. They also indicate that Northern Spy is heterozygous in respect of this character."

An interesting aphid of the pecan, T. L Bissell (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 551–553, pl. 1*).—This is an account of *Myzocallis fumipennellus* F., which injures pecan foliage in several sections of the pecan belt, including southern Georgia. It is said that heavy infestation may cause defoliation.

Significance of the mid-season units counts on resistant black scale, A. F. Swan and C. E. Duggan (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 532–542, figs. 5*).—The authors report upon the methods employed and observations made with the view to securing data on the significance of unit counts on immature scale in the citrus belt of California, where this system has been applied to mature scale in the spring to determine the degree of scale infestation.

The use of oil sprays on citrus during 1926, R. S. Woglum (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 530, 531*).—The author reports that highly refined oil sprays were quite extensively used on citrus in California during 1926, the scale kill having been quite satisfactory with some materials. Various injurious influences were occasionally noted, such as retarded coloration, reduced crop, and impaired quality. Avoidance of such injury has been attempted by particular attention to application, strength, and fruit picks. It is pointed out that the combination spray-fumigation is the most successful way of controlling resistant scales.

The bagworms of Texas, F. M. Jones and H. B. Parks (*Texas Sta. Bul. 382 (1928), pp. 36, figs. 21*).—Following a general account of the life history of the bagworm, brief summarized accounts are given of the several species occurring in Texas, including the bagworm; the live oak bagworm (*Oiketicus abbotii* Grote); three desert bagworms, namely, the tornillo bagworm (*O. townsendi* Towns.), the locust bagworm (*O. bonniwelli* Barnes & Benjamin), and the big-stick bagworm (*O. dendrokomos* Jones); the mesquite bagworm (*O. toumeyi* Jones); the mountain cedar bagworm (*Oiketicus* sp. (?)); the pine bagworm (*Thyridopteryx vernalis* Jones); the creosote bush bagworm (*T. meadii* Edw.); the lawn bagworm (*Eurukuttarus confederata* Grote & Robinson); the orange bagworm (*Platoeceticus gloverii* Barnes & Pack.); the mimosa bagworm (*P jonesi* Barnes & Benjamin); the chalk-hills bagworm (*E. edwardsii* Heylaerts (*carbonaria* Pack.)); the oasis bagworm (*E. polingi* Barnes & Benjamin); the lichen bagworm (*Prochalia pygamaea* Barnes & McDunnough); and the solitary bagworm (*T. alcora* Barnes).

It is pointed out that none of the females of the Texas bagworms possess wings, and that their distribution and spread are frequently due to winds which transport the young larvae as they let themselves down by silk threads or release their hold on the herbage. Hand picking when practical, and the use of arsenical sprays applied when the larvae are young, are measures recommended for their control.

Studies on the life-history and the control of Zeuzera pyrina L. in Palestine, F. S. Bodenheimer and H. Z. Klein ([*Zion. Organ.*] *Inst. Agr.* [*etc.*], *Agr. Rec., 1 (1927), pp. 63–88, figs. 5; abs. in Rev. Appl. Ent., 15 (1927), Ser. A, No. 7, pp. 343, 344*).—This is an account of the leopard moth, which is one of the most serious pests of olive and apple trees in Palestine, where it has also been recorded on pear, plum, and Platanus.

Some results with bait pans against the oriental moth, L. molesta Busck, J. R. STEAR (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 565–571*).—Bait-pan experiments made by the author at Chambersburg, Pa., during 1926 and 1927 failed to give appreciable control. Tests made with various methods of placing bait pans showed that while a pan in every tree gave the highest catch, a pan in every second tree caught almost as many.

European corn borer and the sweet corn crop, T. H. PARKS (*Ohio Veg Growers' Assoc. Proc., 13 (1928), pp. 84–89*).—This is a discussion of the situation in Ontario and Ohio.

Life history of the codling moth in Virginia, W. J. SCHOENE, W. S. HOUGH, L. A. STEARNS, L. R. CAGLE, C. R. WILLEY, and A. M. WOODSIDE (*Virginia Sta. Bul. 261 (1928), pp. 56, figs. 8*).—This is a report of life history studies conducted at Blacksburg, Leesburg, Salem, Staunton, and Winchester during the years 1921 to 1927, inclusive.

The investigations have shown the life of the insect to be influenced to a marked degree by the weather. In the northern part of the State in most seasons there is one full brood, a partial second, and a small third brood, although if the weather be cool, as was the case in 1924, there is no third brood in that section. In the vicinity of Roanoke there is usually one full first brood and 60 to 80 per cent of a second brood, with the third brood ranging from 20 to 50 per cent of a full brood, depending upon the season.

The studies of the data obtained show the life history of the codling moth to be highly variable, that it is speeded up or delayed by extremes of high and low temperatures, and that it would not be possible to make correct recommendations for orchard treatment without an occasional observation of the development of the pest.

The details of the investigation are presented in large part in tabular form.

An investigation of spray coverages and arsenical residue in relation to the control of the codling moth, R. H. SMITH (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 571–588, pl. 1, figs. 2*).—The results obtained in investigations conducted at the California Citrus Experiment Station indicate, among other things, that the fine-spotted or "mist" coverage is decidedly the least protective of all, that the protectiveness of any type of coverage varies directly with the amount of arsenic per square centimeter of fruit surface, that the thickness of the film is an important limiting factor in the protectiveness of the film coverage, that overspraying of trees and the use of more lead arsenate than has been recommended in the past are advisable if the maximum effectiveness of the spray is desired, that the completeness of coverage and the amount of arsenic deposited on the fruit vary directly, within certain limits, with the quantity of spray applied per cubic yard of tree volume, that a large percentage of larvae enter the apples unharmed or produce serious injury to the fruit by burrowing directly through the deposit of lead arsenate, and that the efficacy of arsenical sprays in protecting apples against the codling moth has been generally overestimated.

A list of 40 references to the literature is included.

Recent developments in codling moth control, B. B. FULTON (*Iowa State Hort. Soc. Rpt., 62 (1927), pp. 40–43*).—A practical discussion in which reference is made to the more recent developments in combating the codling moth.

Tropic responses of codling-moth larvae, N. E. MCINDOO (*Jour. Econ. Ent., 21 (1928), No. 4, p. 631*).—This is an abstract of a paper presented at the annual meeting of the American Association of Economic Entomologists.

An experiment in trapping cutworms, W. D. WHITCOMB (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 592–598, figs. 3*).—This is a contribution from the Massachusetts Experiment Station in which it is reported that 7,703 cutworms were trapped between April 27 and July 17, 1927, by the use of chickweed. The red-backed cutworm, striped cutworm, and *Euxoa perpolita* comprised 94.34 per cent of the larvae collected.

Mosquito remedies and preventives, L. O. HOWARD and F. C. BISHOPP (*U. S. Dept. Agr., Farmers' Bul. 1570* (*1928*), *pp. II+13*).—This describes the measures, substances, and materials, both offensive and defensive, that have been found most effective against mosquitoes. It is a revision of and supersedes Farmers' Bulletin 444 (E. S. R., 25, p. 359).

The potato scab gnat, H. L. GUI (*Ohio Veg. Growers' Assoc. Proc., 13* (*1928*) *pp. 24–31*).—This is a contribution from the Ohio Experiment Station on (*Epidapus*) *Pnyxia scabiei*, a pest first described by Hopkins at the West Virginia Experiment Station in 1895 (E. S. R., 8, p. 320), and which during the years 1926 and 1927 was of considerable importance to the potato growers of Ohio. The damage is caused by a reduction in yield due to seed piece injury and to impaired quality of the infested crop through wounds on the tuber. Eggs varying in number from 16 to 103, the average being 55, may be deposited by a single female, usually in the soil. They hatch in an average of 6.5 days. Feeding, which commences as soon as the larvae leave the egg and continues for about 16 days, is followed by a pupal period of 3 to 4 days. The author has observed fields where the pest had become so numerous on the seed that the entire fleshy part of it was destroyed, leaving little except the skin. An actual reduction of 28 per cent was observed in a stand in one field, and fully 25 per cent of the living plants appeared weak and unthrifty.

It is pointed out that while seed treatment and crop rotation will tend to reduce the injury, it can not be claimed that such practices are effective controls.

Phyllophaga of Mississippi, J. M. LANGSTON (*Mississippi Sta. Tech. Bul. 15* (*1927*), *pp. 103, pls. 13*).—In this synopsis the author deals with 45 species and 3 varieties of May beetles of the genus Phyllophaga known to occur in Mississippi. An account of its habitat and food plants accompanies the technical description of each form. A key to the 18 groups, 11 of which occur in Mississippi, keys to the species of 11 of the groups, and a list of 24 references to the literature are included. A glossary of technical terms is appended.

How to combat the Epilachna pest [trans. title], P. VAN DER GOOT (*Landbouw* [*Buitenzorg*], *3* (*1928*), *No. 12, pp. 771–788; Eng. abs., pp. 787, 788*).—This is an account of the ladybird beetle *E. 28-punctata* Muls., the most important enemy of the potato crop in Java. The species is said to occur commonly on wild-growing solanaceous plants from sea level to far up in the mountains, but becoming scarce above an altitude of 1,500 meters (4,920 ft.). Its most serious injury to potato plants has been reported from districts at an altitude of 1,200 meters.

Hand picking of the adult beetles is said to be the only control measure practiced by farmers, no measures being taken against the half-grown larvae although they are far more injurious. The application of 2 per cent arsenate of lead is recommended by the author.

A foreign book pest enters Boston, R. L. TAYLOR (*Jour. Econ. Ent., 21* (*1928*), *No. 4, pp. 626, 627*).—An account of this tropical anobiid beetle (*Catorama* sp.) has been noted from another source (E. S. R., 59, p. 561).

The relation of leaf color and leaf size to boll weevil infestation, D. ISELY (*Jour. Econ. Ent., 21* (*1928*), *No. 4, pp. 553–559*).—Field experiments conducted in 1925 and 1926 at the Arkansas Experiment Station indicate that the boll weevil has a marked preference for cotton plants with green foliage over those with red foliage. It apparently has little choice between small leafed and large leafed varieties, provided the size and vigor of the plants is about the same.

Boll weevil investigations, E. F. GROSSMAN (*Florida Sta. Rpt. 1927, pp. 40–42*).—The progress (E. S. R., 56, p. 861) of boll weevil investigation work is reported upon.

In poisoning work, dusting with calcium arsenate was compared with five other methods. The results were similar to those obtained during four years of boll weevil field poisoning carried on in southern Georgia. Calcium arsenate dusting was slightly in the lead, followed closely by dusting by the 50–50 mixture of calcium arsenate and hydrated lime. The two methods of mopping with a sirup mixture, (1) mopping throughout the poisoning season and (2) mopping until the cotton bloomed heavily and applying calcium arsenate dust for the remainder of the season, showed up practically as well as the calcium arsenate dust. It is pointed out that when early poisoning is followed the cotton plants are small and mopping with sirup mixtures becomes as efficient as dusting. Numerous infestation counts and field observations made during the entire season showed that the cotton poisoned early did not require poison during July and August, since practically all of the hibernated weevils had been killed and both a bottom and middle crop were set and amply protected. Cotton treated by the Florida method suffered from reinfestation by hibernated weevils which arrived in the field after the square stripping, about June 5, and poisoning had been completed.

In the study of hibernated weevil infestation a well-infested field was selected. The following spring only three-fourths of an acre of this field was planted in cotton and thinned out to about 3,500 plants. The plants were examined three times a week, and all weevils captured and recorded as they appeared in the field. In 1926 the weevils started to enter the field at Gainesville on May 10, and continued to enter the field until the first week in July, when the triweekly counts showed a decided drop. The maximum infestation occurred on June 20. In 1927 the first weevil found in the field at the same place was taken on April 27, weevils continuing to enter the field until July 1, when few weevils were detected. The maximum number of hibernated weevils entering the field occurred on June 13, a week earlier than in the preceding year.

The work led to the conclusion that the most effective and economical method of poisoning consisted in its application as soon as the cotton first squared and in its continuation for about four weeks, by which time practically all the weevils emerging from hibernation in the open had found their way to the cotton fields.

Boll weevil control tests (*Georgia Coastal Plain Sta. Bul. 9 (1928), pp. 20, 21*).—Tests conducted to determine the most effective method of using arsenical poisons to control boll weevil have shown conclusively the value of early poisoning, that applications should be begun a week to ten days before squaring, and that two or preferably three applications should be made at weekly intervals.

Enemies of bees, A. G. BELIAVSKIĬ [BELIAWSKY] (*Vragi Pchel. Leningrad: Mysl, 1927, pp. 204, pls. 2, figs. 148; rev. in Amer. Bee Jour., 68 (1928), No. 6, pp. 289, 290*).—This handbook of the enemies of bees in Russia, 69 in number, is presented in eight parts. Part 1 deals with 7 mammal forms, part 2 with 14 bird forms, part 3 with 5 species of reptiles, part 4 with 2 amphibians, part 5 with 35 insect or hexapod forms, part 6 with 3 arachnoids, part 7 with 1 species of Vermes, and part 8 with 2 Protozoa.

Some additional notes on the pine-needle mite, Eriophyes pini Nalepa, E. WALTHER (*Jour. Econ. Ent., 21 (1928), No. 4, pp. 628–631*).—This mite appears to be rather widely distributed and seems to be carried over short distances by the wind. The carriage by man of cut branches and young trees seems to account for its sudden appearance in new localities. Spraying has been fairly successful on a small scale, but careful reforestation seems to promise the only permanent cure, providing only clean young trees are planted after previous removal of all infested pines.

ANIMAL PRODUCTION

[Nutrition studies at the Alabama Station] (*Alabama Sta. Rpt. 1927, pp 10, 11, 18, 19*).—The results of two experiments are noted, continuing earlier work (E. S. R., 59, p. 65).

The effect of minerals on growth and reproduction, W. D. Salmon.—Growth was rather poor and no reproduction occurred with rats on either a ration of yellow corn, peanut meal, and 3 per cent of cod-liver oil or yellow corn, wheat, peanut meal, meat meal, and 3 per cent of cod-liver oil. Adding 1 per cent of salt to either ration improved the rate of growth but did not allow for reproduction on diet 1. On diet 2, 83 young were born and 26 raised. Adding 1.5 per cent of bone meal or 1.5 per cent of bone meal and 7.5 per cent of dried yeast further improved diet 1 for growth and reproduction and made diet 2 more satisfactory for growth than the addition of salt alone, but made no difference in reproduction or the ability to raise the young.

Stability of the antineuritic vitamin toward heat, E. R. Miller and E. F. Williams.—In this study pigeons were fed a commercial chicken feed, both whole and powdered, which had been heated to 130° C. for either 5 or 10 hours. This feed was fed in conjunction with heated or sterilized rice and compared with the same feeds that had not been heated. On the whole, the pigeons on the heated ration did about as well as those on the unheated. Some of the birds on the feed that had been heated 10 hours showed signs of polyneuritis at death, and all of the birds died within 90 days no matter what combinations of feeds were used. Post-mortem examinations showed that the pigeons fed the powdered material, which was quite difficult to administer, probably died from improper feeding.

Effect of variation of potassium and chlorine in a wheat ration, J. L. St. John (*Jour. Agr. Research* [*U. S.*], *37 (1928), No. 1, pp. 55–64, figs. 5*).—Using the same ration as in the study previously noted (E. S. R., 54, p. 357), which contained 0.32 per cent potassium, different amounts of potassium bicarbonate were added to the basal ration for rats to form rations containing from 0.35 to 4.16 per cent of potassium. It was found that when the basal ration with enough potassium added to bring the content to more than 1 per cent was fed to 150-gm. rats they lost weight. Rations containing 0.4 to 0.8 per cent potassium fed to young animals produced approximately the same growth as did the basal ration. When animals received rations with added potassium for any length of time, no young were produced.

A similar basal ration was fed to rats, but in this test the calcium and sodium content was kept constant while the chlorine content was varied by additions from 0.05 per cent in the basal ration to a maximum of 1.14 per cent. The addition of chlorine in any amounts did not improve the ration for promoting growth. In some cases reproduction occurred among the rats fed additional chlorine, but there was no evidence that reproduction varied with the amount of chlorine present.

A study of certain processes for fermenting or enzymatizing feeds, A. E. Perkins and **C. F. Monroe** (*Ohio Sta. Bimo. Bul., 13 (1928), No. 5, pp. 163–169*).—For a period extending from February to June chemical analyses were made of samples of feed before and after being treated by a process which is claimed to change the crude fiber of roughages into the simpler and more useful forms of carbohydrates. The process consists of feeding chopped roughage into the top of a silo-like tank, treating with hot water, salt, and a converter, and then removing the treated material from the bottom. An examination revealed the presence of ground malted barley, salt, and various flavoring and tonic substances as the chief ingredients of the converters.

The studies led to the conclusion that the process was not capable of breaking down the crude fiber to any appreciable extent, nor was any worth while amount of maltose, dextrose, or other reducing sugar formed from the roughages during the process. The converters studied were quite efficient as enzymes in converting starch to reducing sugars when true starches were present in considerable amounts, the starch grains were broken up, and the temperature was at approximately 185° F.

To test the value of this conversion, two lots of rats were fed on a ration of corn 43 parts, oats 43, alfalfa 6.5, corn stover 6.5, and salt 1 part. The entire feed was wet with an equal weight of water, steamed for 0.5 hour and cooled. To half of the feed was added a converter in an amount equal to 1 per cent of the dry weight of the feed, and both parts were incubated at 130 to 140° for 36 hours. Each group of rats was fed as much as they would consume without waste. Growth was normal in both groups, but such differences as existed favored the check-ration group.

A survey of farms having this equipment showed that the better farmers and feeders who had used this process were abandoning it, and those who still used it were unable to show by reliable records any benefit derived.

Ground oats as a partial substitute for shelled corn, H. W. Rogers and **P. Gerlaugh** (*Ohio Sta. Bimo. Bul., 13 (1928), No. 5, pp. 172, 173*).—The value of ground oats as a partial substitute for shelled corn in the ration for fattening yearling steers was demonstrated at the Madison County Experiment Farm. Two lots of 11 head each, averaging in weight approximately 730 lbs. each, were fed for 140 days. Lot 1 received shelled corn and lot 2 equal parts of shelled corn and ground oats. The remainder of the ration in both lots consisted of linseed meal, mixed hay, and corn silage. The average daily gains were 2.21 and 2.12 lbs. per head in the respective lots. Lot 2 required less than half as much protein supplement to produce 100 lbs. of gain as did lot 1, and the feed cost was lower in this lot. More pork was produced in the lot fed shelled corn, but the finish was approximately the same in both groups. Lot 2 made higher returns per steer even after crediting the hog gains.

Winter feeding and time of marketing steers, J. C. Grimes (*Alabama Sta. Rpt. 1927, p. 11*).—Limiting the winter ration and finishing steers on grass again proved the most profitable manner of handling (E. S. R., 59, p. 662). Feeding 4.73 lbs. of cottonseed meal daily to steers being finished on pasture increased the profits $5.55 per head. Adding 2.18 lbs. of cottonseed meal per day to a winter ration of Johnson grass hay increased by 0.23 lb. the average daily gains per head. The addition of a medium allowance of blackstrap molasses to a ration of Johnson grass hay and cottonseed meal, while increasing the rate of gain, did not increase the profits.

The effect of gestation and lactation upon the growth and composition of swine, D. J. Griswold, P. F. Trowbridge, A. G. Hogan, and **L. D. Haigh** (*Missouri Sta. Research Bul. 114 (1928), pp. 62, figs. 4*).—In this study 10 purebred Duroc-Jersey gilts, 7 months old at the initial date, were used. One animal was slaughtered at the beginning of the test, 7 were bred, and the other 2 left as open control animals. Of the bred gilts 1 was killed after 88 days of pregnancy, another just before farrowing, and 2 others just after farrowing. One of the open gilts was killed at the farrowing time of the pregnant animals. The other 3 pregnant gilts and 1 open gilt were carried through the lactation period of 68 days and then killed. Records were kept of live weights and feed consumption, and measurements of the living animals were made every 30 days (E. S. R., 50, p. 466). At slaughtering time the weights of organs and parts were recorded, and the carcass was separated into wholesale cuts and finally into lean, fat, and bone. Chemical analyses were made of separate parts of each gilt and of newborn pigs and 88-day-old embryos. Digestion trials were conducted to obtain the digestion coefficients for open, pregnant, and lactating gilts.

It was found that during the gestation period gilts grow and fatten as readily as do nonpregnant gilts, but during lactation growth is retarded and the reserves of fat and minerals are depleted. The water percentage of pig embryos was larger than that of newborn pigs, and this percentage decreased as the animals matured. Fat percentage bore an inverse relation to the water content. There was more sodium, chlorine, and sulfur and less magnesium, potassium, and silica in prenatal and newborn pigs than in partly grown and grown animals. The iron content was low and constant for all ages and conditions. Calcium phosphate made up about 75 per cent of the total ash and was approximately the same in all animals with the exception of the embryos, where it was somewhat less. The coefficients of digestibility were somewhat higher for pregnant animals than for open gilts, and it was found that confining the animals in crates during the digestion trials gradually decreased the amount of fat digested. During lactation more ash was excreted than was digested.

[Swine feeding tests at the Alabama Station] (*Alabama Sta. Rpt. 1927, pp. 11, 12, 13, 18*).—The results of experiments in continuation of those previously noted (E. S. R., 59, p. 663) are reported.

Forage crops for fattening hogs, J. C. Grimes.—Pigs averaging approximately 55 lbs. were divided into 3 lots of 8 or 9 head each and fed for 84 days. All lots received corn, tankage, and minerals. In lot 1 the ration was self-fed in dry lot, in lot 2 self-fed on 0.75 acre of oats and vetch pasture, and in lot 3 hand-fed at the rate of 3 per cent of the live weight on pasture. The average daily gains were 1.02, 1.4, and 0.97 lbs. per head in the respective lots, and it required 3.74, 3.36, and 2.87 lbs. of feed to produce 1 lb. of gain. The profit per pig was greatest in lot 3 and least in lot 1.

Effect of color of soybeans on gains of hogs and quality of carcass, W. D. Salmon.—In this study Mammoth Yellow and Tar Heel Black soy beans were compared as a supplement in a ration of corn, soy beans, and minerals self-fed in dry lot. The first 28 days the pigs on the black beans made an average daily gain of 2 lbs. per head and required 310.8 lbs. of feed for 100 lbs. of gain. Those on yellow beans gained at the rate of 1.6 lbs. per day and consumed 390.3 lbs. of feed per 100 lbs. of gain. During the second 28 days some of the pigs on the black beans became stiff and lame with a tendency to go down behind. These symptoms did not appear in the yellow bean lot. During this period the average daily gains were 0.76 and 1.82 lbs. in the respective lots, and the feed requirements per 100 lbs. of gain were 692.4 and 432.8 lbs. The carcasses were slightly softer in the black bean lot, probably due to the lighter weight of the hogs and the higher proportion of beans consumed in this lot.

Effect of a starvation period on the firmness of the carcass of hogs, W. D. Salmon.—Twelve pigs weighing from 100 to 137 lbs. each were fed peanuts, tankage, cod-liver oil, and minerals to a weight of 200 lbs., then starved for losses varying from 20 to 45 lbs., and then fed to 225 lbs. on corn, shorts, and tankage. The iodine numbers as determined on the fat back of each hog at slaughter varied from 74.5 to 89.41, and did not indicate that starvation had any practical effect in increasing the firmness of the fat.

Velvet bean rations for brood sows, E. R. Miller and J. C. Grimes.—A sow was fed velvet beans in the pod and a mineral supplement the first 48 days of her gestation period and ground raw velvet bean seed, minerals, cod-liver oil, and 10 per cent casein for the remainder. On this ration she farrowed 12 pigs, 4 of which were dead at birth. The dead pigs averaged 2.43 lbs. and the living pigs 1.88 lbs. at birth. The pigs grew well, and the sow had a good supply of milk till the eighth day after farrowing. On this date the sow passed a badly decomposed and partly absorbed pig, and from that time on the gains of the pigs and the milk supply of the sow declined.

Swine feeding, J. M. Scott (*Florida Sta. Rpt. 1927, pp. 31, 32*).—Continuing the feeding experiments with swine (E. S. R., 56, p. 864), two groups of 12 pigs each, averaging approximately 78 lbs., were fed in dry lot for 66 days. Lot 1 received shelled corn and fish meal at the rate of 9 parts of corn to 1 part of fish meal. Lot 2 was fed shelled corn 9 parts, cottonseed meal 0.75 part, and alfalfa meal 0.5 part by weight. The average daily gains in the respective lots were 0.65 and 0.3 lb. per head. Lot 2 required about 2.2 times as much feed to produce 100 lbs. of gain as did lot 1.

Oats for growing and fattening pigs, W. L. Robison (*Ohio Sta. Bimo. Bul., 13 (1928), No. 5, pp. 174–178*).—Growing pigs fed a ration of hulled oats and tankage gained 1.25 lbs. daily and required 307.2 lbs. of feed for each 100 lbs. of gain. Similar pigs on the same ration except that it contained 22 per cent of oat hulls gained 1.03 lbs. daily and required 323.5 lbs. of hulled oats and tankage and 91.9 lbs. of oat hulls to produce 100 lbs. of gain.

The results of two experiments (E. S. R., 59, p. 261) are summarized on the value of oats for growing and fattening pigs of an initial weight of approximately 50 lbs. Tankage, linseed meal, ground alfalfa, and minerals were fed to all lots. Lot 1 received corn, lot 2 oats, lot 3 corn and a limited amount of oats, and lot 4 hulled oats. The average daily gains in the respective lots were 1.1, 0.91, 1.15, and 1.27 lbs. Using oats as a complete substitute for corn increased the feed required per 100 lbs. of gain 26.8 per cent and the time required to reach a market weight of 210 lbs. by 31 days. When 1 part of oats was fed to each 2.5 parts of corn, the feed requirement was approximately the same, but the oat-fed pigs required 6 days less time to reach market weight. Pigs fed hulled oats required 23 per cent less feed and 19 days less time to reach market weight than those fed corn.

In the first of the above experiments, hulled oats replaced linseed meal in the ration. The lot receiving hulled oats made an average daily gain of 1.38 lbs. per head and reached market weight in 13 days less time than those fed linseed meal. The latter lot made an average daily gain of 1.24 lbs. per head.

Studies in horse feeding and maintenance, J. M. Thompson (*Minnesota Sta., Duluth Substa. Rpt. 1926–1927, pp. 56–60*).—During the year 1923 detailed records were kept of the feed consumption, monthly weights, and labor output of six horses. The ration fed consisted of hay and a grain mixture of cracked corn and crushed oats, with two bran mashes per week. Night pasture was utilized whenever possible to reduce the amount of roughage necessary, and on idle days the grain ration was reduced by half.

The horses averaged 2.37 hours daily labor in March and 8.68 hours in May, the two extremes of the year, while the average daily labor for the year was

5.98 hours. The average daily consumption of feed was approximately 29 lbs. of hay and 10 lbs. of grain. The horses attained their heaviest weight and did their heaviest work while on night pasture and a grain ration under 2 per cent. This system permitted a saving of one-half of the hay. Minimum weights were observed in the spring following a long period of heavy hay feeding. The maximum gain was 135 lbs. and the mean gain 64 lbs. during the year.

[Experiments with poultry at the Alabama Station], J. E. IVEY (*Alabama Sta. Rpt. 1927, pp. 14–16*).—Results of two experiments are noted.

Vegetable protein studies.—In this study a basal ration of equal parts of ground corn, ground oats, and standard wheat middlings was fed. Two pens of 35 White Leghorns received in addition enough cottonseed meal to make a 13 per cent digestible protein content, 2 other pens peanut meal to the same protein content, 2 others soy-bean meal, and a control pen meat meal. Oyster shell and calcium carbonate grit were available in all pens at all times, and green feed and a mineral mixture were fed at the same rate to each pen. The average number of eggs per bird produced from November 1 to October 31 in the cottonseed-meal groups was 137; in the peanut meal, 117.75; soy-bean meal, 128.6; and meat meal, 113.1. The percentage of mortality was 8.75, 14.28, 21.43, and 14.43 in the respective groups. In the cottonseed-meal groups 11.18 per cent of the eggs set were infertile, 9 per cent of the embryos were dead on the eighteenth day and 39.8 per cent on the twenty-first day, and 39.6 per cent of the eggs hatched. The corresponding figures for the peanut-meal groups were 8.04, 3.63, 20.89, and 67.3 per cent; for the soy-bean meal groups, 19.19, 8.49, 32.83, and 39.47 per cent; and for the meat-meal group, 9.77, 4.8, 23.68, and 61.7 per cent.

Force molt studies.—The same basal ration was used in this as in the previous study. In addition each of 3 lots of 35 White Leghorns received 7.5 lbs. of whole yellow corn per 100 birds per day, enough animal protein to bring the digestible protein content to 20 per cent, and 4 lbs of a mixture of steamed bone meal, marble dust, and salt 2:1:1 parts to each 100 lbs. of mash. Two lots were force molted in June by denying the laying mash for 14 days, followed by a dose of Epsom salts, and immediately placing them on the regular mash mixture. The remaining pen was not force molted. The force-molted pens produced an average of 117.9 eggs during the year, and had a mortality percentage of 18.57. In these pens 11.23 per cent of the eggs set were infertile, 6.74 per cent of the embryos on the eighteenth day and 21.1 per cent on the twenty-first day, were dead, and 60.9 per cent of the eggs hatched. The corresponding figures for the control pen were 110.8 eggs, 17.14 per cent, 12.9, 8, 16.55, and 62.5 per cent.

[Experiments with poultry at the Duluth, Minn., Substation], M. J. THOMPSON (*Minnesota Sta., Duluth Substa. Rpt. 1926–1927, pp. 43–47, 55, fig. 1*).—Two years' results of the effect of lights upon egg production for the period from November to April showed that pullets in lighted pens produced 7 more eggs each than those in the dark pens during the first winter and 11 more eggs the second winter. In April of both years the birds in the unlighted pens produced more eggs than those in the lighted pens.

When the outside temperatures were 8.6° to 13.1° F., the inside temperatures of a small shed-roof laying house equipped with shutter ventilator were 36.5° and 38.4°. The average production per bird from November to April in this house was 67.9 eggs. In a house equipped with a patent ventilator the inside temperature was 33.46° when it was 16.67° outside, and 30.72° when it was 0.64° outside. The average production per bird in this house was 77.77 eggs.

Green feed and pasture for poultry, H. A. Schoth (*Oregon Sta. Circ. 85 (1928), pp. 16, figs. 5*).—A popular publication designed to bring to the attention of poultrymen better methods of producing green feed and pasture, the crops best suited to their needs, and the economical utilization of such crops.

New model mash feed for layers, D. C. Kennard (*Ohio Sta. Bimo. Bul., 13 (1928), No. 5, pp. 179, 180, fig. 1*).—Directions are given for constructing a new type of reel mash feeder for laying hens that has proved quite successful in tests at the station.

The feeding of cod-liver oil, O. N. Massengale (*New Jersey Stas. Hints to Poultrymen, 16 (1928), No. 11, pp. 4, figs. 2*).—The author discusses the value of cod-liver oil in the poultry ration, the amounts recommended by the stations, and the reasons for such recommendations, the kind of oil to use, and the value of minerals in addition to the oil.

Turkeys, W. C. Thompson and F. R. Beaudette (*New Jersey Stas. Hints to Poultrymen, 16 (1928), No. 12, pp. 4, fig. 1*).—A popular publication setting forth facts concerning turkey raising and discussing the more common diseases and parasites.

A practical incinerator for poultry plants, C. B. Hudson (*New Jersey Stas. Hints to Poultrymen, 16 (1928), No. 10, pp. 4, figs. 2*).—After discussing the sanitary needs of poultry plants, the author describes the construction of two incinerators that have proved satisfactory and economical for disposing of dead birds.

DAIRY FARMING—DAIRYING

Some physical and physiological activities of dairy cows under conditions of modern herd management, J. M. Fuller (*New Hampshire Sta. Tech. Bul. 35 (1928), pp. 30, figs. 3*).—This investigation has been carried on cooperatively with the Carnegie Institution of Washington, and has brought out some significant new facts (E. S. R., 59, p. 266) on the daily activity and behavior of dairy cattle.

The average consumption of water for 16 milking cows over a 3-day period was 4.38 lbs. of water for each pound of milk produced. During this period the same cows voided 26.8 lbs. of urine and 59 lbs. of feces per 1,000 lbs. live weight. Observations on 4 cows producing from 11 to 60 lbs. of milk daily showed that they spent an average of 5 hours 57 minutes in eating and 8 hours 5 minutes in rumination. The average time spent in chewing an individual cud was 53.9 seconds and in swallowing and regurgitating the cud 3.73 seconds. The average jaw movements of cows while eating grain and silage were 94 per minute, while eating hay 78, and while ruminating 55. The total jaw movements approximated 41,000 per day.

From some 1,700 observations the average respiration rate per minute of Ayrshires was calculated to be 28.6, of Guernseys 18.6, of Holsteins 28.6, and of Jerseys 21.7. The average pulse rate per minute of Ayrshires was 69.6, of Guernseys 59.8, of Holsteins 68.6, and of Jerseys 62.7. For Ayrshires and Holsteins the ratio of respiration to pulse rate was 1:2.4, for Jerseys 1:2.8, and for Guernseys 1:3.2. Observations on 7 high-producing cows confined in box stalls showed appreciably higher pulse and respiration rates as compared to the cows in the regular herd, and there was considerable variation in the rates for these cows during the day.

Minerals in the dairy ration, W. H. Eaton (*Alabama Sta. Rpt. 1927, pp. 12, 13*).—In this study (E. S. R., 59, p. 667) the dairy herd was divided into three groups, in each of which the feeding and care were similar, except that lot 1 received no mineral supplement, lot 2, 4 oz. of steamed bone meal per head daily, and lot 3, 4 oz. of marble dust daily. As the calves were dropped they were weighed and measured, and a study of these records of 27 calves showed that those from the cows without minerals were heavier at birth and slightly larger in five measurements at 28-day intervals than those of the mineral-fed cows. The average production over a 10 months' period for the respective groups was 4,623, 5,631, and 4,818 lbs. of milk.

[Experiments with dairy cattle at the Florida Station], J. M. Scott (*Florida Sta. Rpt. 1927, pp. 27–31*).—The results of two experiments are briefly noted.

[*A comparison of alfalfa meal and Crotalaria meal for dairy cows*].—In comparing the above meals 2 lots of 3 cows each were fed by the double reversal system through 3 periods of 28 days each. Each cow received a daily ration of 12 lbs. of the following mixture: Alfalfa or Crotalaria meal 125 lbs., corn meal 75 lbs., ground oats 50 lbs., cottonseed meal 50 lbs., and peanut meal 25 lbs. The total milk produced on feeding alfalfa meal was 3,577 lbs. and on feeding Crotalaria meal 3,417 lbs. As this was the first test ever conducted with Crotalaria meal, the results are considered preliminary and no conclusions are drawn.

Comparison of corn silage and Napier grass silage for milk production.—Continuing this study (E. S. R., 55, p. 870), a group of 7 cows was fed for 2 periods of 90 days each with a 5-day transitional period. All cows were fed the same ration. During the 90 days the animals received corn silage they produced 9,568 lbs. of milk, and during the 90 days they received Napier grass silage 7,053 lbs. of milk were produced.

Lessons from the university dairy herd, H. S. Willard (*Wyoming Sta. Bul 160 (1928), pp. 36, figs. 6*).—In a study of the records of the university dairy herd from 1910 to 1928 the data have been divided into three groups, (1) records of cows with pasture, (2) records of cows without pasture, and (3) miscellaneous items from all records.

On the average it required 2,548 lbs. of concentrates, 4,137 lbs. of dry roughage, and 150 days of pasture to carry an average cow for 1 year. To produce 100 lbs. of milk testing 4.6 per cent butterfat the average requirement was 40.2 lbs. of grain, 65.2 lbs. of dry roughage, and 2.36 days of pasture. In general, high milk yields resulted in high income over feed cost, but in the instances where high yield was brought about by too liberal feeding it was not as economical as low production. Yearly production was influenced by the time of breeding, and delayed breeding to produce high records was not always economical over a period of years.

Normal milk production was secured when cows were fed without pasture and without supplementary mineral or high protein feeds, but feeding roughage during the normal pasture season was not an economical practice. Variations in yearly milk production were found to be due to time of breeding, number of milkings per day, age, and length of dry period. There was no significant difference in the production of cows freshening in spring-summer and fall-winter seasons under the system of management followed. Butterfat tests varied from milking to milking and from day to day, and for Holstein and Ayrshire cattle with the stage of lactation and season. Cows tended to produce lower testing milk during the summer months.

Washing powders for dairy use, A. W. Phillips, M. J. Mack, and J. H. Frandsen (*Massachusetts Sta. Tech. Bul. 13 (1928), pp. 177–187*).—Chemical analyses were made to determine the kind and amount of ingredients present in 36 brands of powder recommended for dairy use. The analyses showed that the powders may be divided into four general classes, as follows: Those containing pure carbonate, those containing trisodium phosphate, those containing free caustic, and those containing soap. The water content and ease of solution varied. The powders containing phosphate were very slow to dissolve, and the soap powders were also somewhat slow and often lumpy. The others dissolved rather readily, but there was a tendency for the hydroxide powders to lump. These latter powders also tended to heat considerably on dissolving, while the phosphate powders tended to cool.

Practical tests were conducted with a standard 0.6 per cent solution based on the dry powder to determine the water-softening power of the powders, the washing power, the emulsifying power, the ease of rinsing, and the action of each upon the metals aluminum, copper, nickel, tin, and zinc. The following table places the ingredients in the order of their effectiveness:

Water-softening powers: Carbonate, phosphate, soap, hydroxide.
Washing powers: Carbonate, hydroxide, soap, phosphate.
Emulsifying powers: Soap, phosphate, carbonate, hydroxide.
Ease of rinsing: Carbonate, phosphate, soap, hydroxide.
Action on metals: Hydroxide attacks aluminum, copper, and tin.
Carbonate attacks aluminum, copper, and tin.
Phosphate attacks aluminum.
Disinfecting values: All powders in strength ordinarily employed act as disinfectants to such a degree as to make the washing solution sterile.

The powders containing free caustic should be avoided for hand washing because of its injurious effect upon the skin, but they may be used for machine washing. A desirable compound that could be prepared at the plant was made by mixing 60 per cent sodium carbonate and 40 per cent trisodium phosphate. Buying the commercial chemicals and mixing at the plant materially decreased the cost of washing powders.

The washing efficiency of the powders increased with heat up to about 140° F., and below 95° their bacterial action was greatly reduced. The 0.6 per cent solution used made the wash water sterile in all cases.

VETERINARY MEDICINE

Report of veterinarian, A. L. SHEALY (*Florida Sta. Rpt. 1927, pp. 78–83*).—A study of the so-called salt sickness in cattle has shown that there are unquestionably many different causes of the condition. The experiments conducted thus far and the author's observations indicate that it is a nutritional disorder resulting from the feeding of an unbalanced ration and possibly a lack of calcium and phosphorus.

Reference is made to the work of D. A. Sanders on Manson's eye worm of poultry, accounts of which have been noted (E. S. R., 58, p. 481). The experiments conducted indicate that larvae passing through the crop to the gizzard are macerated and killed by the muscular action of this organ and by the grit which it normally contains. It has been found possible to infest wild birds with this parasite by feeding them on roaches containing the larvae of the parasite. The birds so infested include the blue jay, meadow lark, rice bird, mocking bird, and blackbird, as well as the pigeon.

In work with leeches in horses three different fungi were isolated from the granules which occur in the lesions of this disease, but it was impossible to produce the disease by injecting pure cultures into susceptible animals. Examinations were made for the presence of *Filaria irritans* with negative results.

The results of post-mortem examinations made on swine infested with the kidney worm (*Stephanurus dentatus*) showed the parasites to be most abundant in the region of the kidneys and along the course of the ureters. They are, however, often present in other portions of the body, including the lungs, pleural cavities, diaphragm, liver, kidneys, spinal canal, peritoneal cavity, and sublumbar muscles. Their presence gives rise to numerous parasitic cysts and abscess formations, varying in size from 0.5 to 4 cm in diameter. Paralysis of the hind quarters occurs in many cases of advanced kidney worm infestation. In two cases the parasite was found within the spinal canal, and it seems highly probable that such infestation is the cause of the paralytic condition in many cases.

Physiology and biochemistry of bacteria.—Vol. I, Growth phases; composition, and biophysical chemistry of bacteria and their environment; and energetics, R. E. Buchanan and E. I. Fulmer (*Baltimore: Williams & Wilkins Co., 1928, pp. XI+516, figs. 78*).—The several chapters of this work deal, respectively, with the scope of physiological bacteriology (pp 1–3); growth phases and growth rates in cultures of microorganisms (pp. 4–62); chemical composition of the cells of microorganisms (pp. 63–138); physicochemical and physical characteristics of microorganisms and of their environment (pp. 139–372); and energy relationships, growth and movement of microorganisms—energetics (pp. 373–461).

The toxicity of tremetol, J. F. Couch (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 5, pp. 603–607, figs. 2*).—This article supplements the accounts previously noted (E. S. R., 58, p. 367; 59, p. 879), the preparation of a larger quantity of tremetol having made it possible to test its effect on sheep, where it caused the characteristic syndrome known as trembles. The data presented supplement the earlier work in such a way as to leave no reasonable doubt that the toxic constituent of richweed responsible for trembles and milk sickness is tremetol.

Disease resistance, F. A. E. Crew (In *National Veterinary Medical Association of Great Britain and Ireland, Annual Congress at Newcastle-upon-Tyne, 1928 London, 1928, pp. 109–122*).—This is a general discussion of the subject, in which the author concludes that such evidence as there is supports the contention that disease resistance exists in fact, and that it is genetic in nature and therefore can be bred into a stock.

The inheritance of resistance to the Danysz bacillus in the rat, M. R. Irwin (*Iowa State Col. Jour. Sci., 2 (1928), No. 3, pp. 213–218*).—The studies reported indicate that resistance is due to a partially dominant, quite complex set of factors, whose interactions with the environmental factors determine the reaction of the individual to the infection.

Is there any possibility of autoinvasion during ascariasis? [trans. title] M. M. Zavadovskiĭ (Zawadowsky) and A. P. Orlov (*Trudy Lab. Èksper. Biol. Moskov. Zooparka (Trans. Lab. Expt. Biol. Zoopark, Moscow), 3 (1927), pp. 99–118; Eng. abs., pp. 117, 118*).—It is thought that the possibility of an autoinvasion is excluded in view of the fact that Ascaris eggs may become invasive only upon access of oxygen, which is absent in the intestine.

Preliminary report of more than a year's work with botulinus anatoxin, C. E. Salsbery and G. E. Jacobi (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 4, pp. 507–512*).—The authors conclude that they have beyond doubt established the fact that animals may be successfully immunized experimentally, they having used a large number of guinea pigs, rabbits, chickens, cattle, and horses. This preliminary report consists largely of tabular data.

A contribution to the study of the immunization against piroplasmosis (babesiellosis) of bovines [trans. title], W. L. Yakimoff et al. (*Ann. Inst.

Pasteur, *42* (*1928*), *No. 3*, *pp. 282–319*).—The first part of this work (pp. 282–291), dealing with the experimental immunization of animals, is by W. L. Yakimoff, Mrs. E. N. Markoff-Petraschewsky, W. L. Loukianoff, and Woitzekhowsky; the second part (pp. 291–301), dealing with immunization by trypanblue, is by Yakimoff, Mrs. Markoff-Petraschewsky, E. F. Rastegaieff, and A. N. Gniedine; and the third part (pp. 302–316), dealing with immunization by Theiler's method, is by Yakimoff, Mrs. Markoff-Petraschewsky, and Rastegaieff.

Immunization by the method of Theiler, which consists in infection with the virus from an animal naturally affected and the subsequent intravenous injection of trypanblue or ichthargan, has been found by the authors to give good results.

The duration of immunity in dogs following the single-injection method of anti-rabic vaccination, A. BROERMAN and B. H. EDGINGTON (*Ohio Sta. Bul. 423* (*1928*), *pp. 13*).—Three experiments conducted in cooperation with the Ohio State Department of Agriculture, the details of which are presented in tabular form, show that street virus of rabies from different sources varies in virulence. The single injection of a vaccine, prepared according to a modification of the method suggested by Umeno and Doi (E. S. R., 47, p. 385) protected dogs against virus from two sources; toward another virus a high degree of immunity was shown; while no protection was evident to a virus from a still different source. Vaccinated dogs were resistant to infection with some strains of rabic street virus six and nine months following vaccination.

While the single injection method of vaccination of dogs against rabies is commendable from a practical standpoint, vaccination can not be depended upon to eradicate rabies until a method is devised that will protect against all strains of rabic street virus.

Notes on trypanosomiasis of cattle in Uganda, U. F. RICHARDSON (*Roy. Soc. Trop. Med. and Hyg. Trans.*, *22* (*1928*), *No. 2*, *pp. 137–146*).—The author's studies have shown that *Trypanosoma brucei* is usually nonpathogenic to cattle in Uganda and that *T. vivax*, although virulent strains may exist, has usually a negligible pathogenicity.

"*T. congolense* infection usually leads to a heavy death rate, but, by passage mechanically from ox to ox, rapidly loses its virulence and appears eventually to become nonpathogenic. Reinoculation with *T. vivax* into 'premune' cases causes swarming peripheral infection. Reinoculation with *T. congolense* appears to cause no reinfection. Transmission occurs readily in the absence of the tsetse fly, and in so short a period that it seems probable no cyclical process is involved. No satisfactory method of diagnosing chronic cases exists, yet it is believed that it is usually from the relapse of such animals that many outbreaks in Uganda arise.

"Treatment with tartar emetic in cases of *T. congolense* infection gives results which seem in practice to be satisfactory; yet it appears to fail as a curative in some cases, and to leave premunized animals which may prove the source of future outbreaks. No treatment has been found to give satisfactory results in the case of *T. vivax* infection."

A method of inoculating cattle against trypanosomiasis, L. E. W. BEVAN (*Roy. Soc. Trop. Med. and Hyg. Trans.*, *22* (*1928*), *No. 2*, *pp. 147–156*).—The author reports that the common trypanosome of cattle in Southern Rhodesia is caused by a strain of *Trypanosoma congolense* and is transmitted by the tsetse fly, *Glossina morsitans*.

"Treatment by means of intravenous injections of potassium antimonyl tartrate was first introduced into Southern Rhodesia in 1909 and has since proved successful in saving the lives of many thousands of animals. In the past it was frequently applied to animals so far advanced in the disease that their recovery was unduly prolonged, but recently animals in the early stages of infection have been detected and treated with better results.

On some estates cattle in danger of infection have been treated systematically once a month. This course has been adopted in order to insure the treatment of recently infected animals. It involves considerable labor and expense. To avoid this a method is suggested whereby cattle can be inoculated, treated, and rendered 'tolerant' before exposure to natural infection. The method involves the standardization in sheep of the strain of trypanosome of the area in which the animals are to be exposed to natural infection, and treatment with potassium antimonyl tartrate appropriately 'timed' upon the basis of the appearance and reappearance of the parasite in the peripheral blood.

"In order to avoid the transmission of bovine diseases other than trypanosomiasis, sheep are used as the reservoirs of the virus. These can be conveyed easily to the place where the inoculation is to be performed, which must not be within the infected area. A form of antimony which can be injected subcutaneously is urgently required for practical reasons."

The therapeutic value of etharsanol and proparsanol in experimental trypanosomiasis in rats and rabbits, W. K. Stratman-Thomas and A. S. Loevenhart (*Jour. Pharmacol. and Expt. Ther., 33 (1928), No. 4, pp. 459–477*).—In studies made of the two new arsenical drugs etharsanol and proparsanol, the former was found of the greater value. Etharsanol was more effective in rat trypanosomiasis than tryparsamide, although in rabbits there seems to be little preference as to the efficacy of the two. Etharsanol was found capable of curing trypanosomal infections in rats and rabbits late in the disease and, in some cases, when the animal is near the point of death. It is concluded that the low toxicity of etharsanol warrants clinical trial in both forms of human trypanosomiasis (*Trypanosome gambiense* and *T. rhodesiense*), dourine, mal de caderas, and nagana.

Bovine subcutaneous tuberculosis, C. A. Mitchell (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 4, pp. 493–506*).—In this account, based upon studies of subcutaneous tuberculosis conducted by the division of pathology of the Canadian Department of Agriculture, it is shown that subcutaneous tuberculosis (1) sensitizes an animal to tuberculin; (2) localizes, as a rule, in the limbs and extremities; and (3) occurs when other lesions, organic and glandular, are either absent or present, but more often in their absence, and in the relative proportion of 2:1.

The account is presented under the headings of character of lesions found, acid-fast organisms and subcutaneous tuberculosis, attempts to cultivate acid-fast organisms direct from tissue, attempts to transmit infection to the calf by means of subcutaneous lesions, attempts to infect laboratory animals, post-mortem of an infected rabbit, isolation of strain, character of organism, history of a herd, and experiments upon calves.

It is thought that work with cattle has not progressed far enough to make any deductions except that subcutaneous lesions may be produced by injecting the organism in pure culture beneath the skin.

A comparative study of tissue cultures inoculated either with Bacillus tuberculosis of bovine type or with the B. C. G. [trans. title], A. Maximow (*Ann. Inst. Pasteur, 42 (1928), No. 3, pp. 225–245, pl. 1*).—The author's studies in vitro have shown B. C. G. to be distinguished from the bovine type by its exceedingly low virulence. Even a small number of bacilli of the bovine type exert a toxic action on the phagocytes, whereas B. C. G. does not show any toxic action on them. The author found that B. C. G. did not vary in its low virulence during the period under observation. It never produced a generalized tubercular infection when subcutaneously injected into the guinea pig.

New experiments with the B. C. G. antituberculosis vaccine [trans. title], TZEKHNOVITZER (*Ann. Inst. Pasteur, 42 (1928), No. 3, pp. 246–255*).—The author, reporting for the Ukraine commission, has found the B. C. G. vaccination to confer a resistance to the experimental infection of bovines by the intravenous injection of *Bacillus tuberculosis*. B. C. G. eliminated in the milk of cows was found to be devoid of all virulence.

The danger to man of bovine and avian tuberculosis, C. H. MAYO (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 5, pp. 563–576*).—This address, in which the present status of knowledge of the subject is reviewed, was presented at the annual meeting of the American Veterinary Medical Association at Minneapolis, Minn., in August, 1928.

Blackleg in cattle, H. WELCH (*Montana Sta. Circ. 136 (1928), pp. 8, figs. 4*).—This is a practical account.

Streptococcic mastitis and means for its control [trans. title], H. A. ZWIJNENBERG (*Tijdschr. Diergeneesk., 55 (1928), No. 14, pp. 709–728; Ger., Eng., Fr. abs., pp. 727, 728*).—Attention is called to the frequent occurrence of mastitis among cattle in the Netherlands, where the great economic loss caused is not sufficiently realized by owners and by many veterinarians.

Botryomycosis of the sheep (abscess of sheep—caseous disease) [trans. title], M. AYNAUD (*Ann. Inst. Pasteur, 42 (1928), No. 3, pp. 256–281, figs. 4*).—The author deals with a particular form of suppuration occurring in sheep that is characterized by the presence of staphylococci, the lesions of which are similar to those of botryomycosis of the horse, ox, and hog.

Braxy-like disease and fluke in sheep: Successful control work reported from Hawke's Bay, C. S. M. HOPKIRK (*New Zeal. Jour. Agr., 37 (1928), No. 1, p. 37*).—The author considers that the fact that the braxy-like disease has been so easily controlled by ridding the farm of liver fluke proves the correctness of the view that the fluke is the carrier of the disease organism into the liver.

Necrotic infectious hepatitis (braxy, black disease) of Australian sheep: The pathogenic rôle of B. oedematiens (Weinb. & Ség.); reproduction of the infection; vaccination by the anaculture [trans. title], A. W. TURNER (*Ann. Inst. Pasteur, 42 (1928), No. 2, pp. 211–224, figs. 2*).—This is a more detailed account than those previously noted (E. S. R., 59, pp. 174, 275).

Lamb dysentery, T. DALLING (*In National Veterinary Medical Association of Great Britain and Ireland, Annual Congress at Newcastle-upon-Tyne, 1928. London, 1928, pp. 55–72*).—The author finds that this disease, evidently widespread in Great Britain, is caused by the toxin of a specific organism which differs from typical *Bacterium welchii* both in its toxin and culturally. While ulceration of the bowel is commonly associated with the disease, the organism can be isolated from lambs dying of "milk ill" in which no ulceration is present.

The conclusion that this organism is the cause of dysentery of the lamb is based on (1) its constant presence in affected lambs and its absence in normal lambs and those dying from diseases other than lamb dysentery; (2) its presence in the soil of infected land and its absence from other soils; (3) its ability to reproduce the disease when fed to or injected into normal lambs; (4) the ability of its antitoxin to prevent lamb dysentery in lambs on infected farms; and (5) the protection of lambs from lamb dysentery by the inoculation of ewes with antigen made from the organism, antibodies being transferred from the ewe to the lamb probably mainly in the milk.

The relation of encapsulated bacilli found in metritis in mares to encapsulated bacilli from human sources, P. R. EDWARDS (*Jour. Bact., 15*

(*1928*), *No. 4, pp. 245–266*).—In studies conducted at the Kentucky Experiment Station of 50 strains of encapsulated bacilli 43 were found divisible into two serological types, 7 having remained untyped. "The 25 cultures recovered from cases of metritis in mares all belong to a single, well-defined type. Three cultures of human origin also fall into this type and are indistinguishable from the equine strains by any of the methods employed. The second type is composed of 14 strains of human origin. The type specificity and virulence of encapsulated bacilli are dependent upon capsule formation."

The antigenic relationship of Bacterium pullorum, Bacterium gallinarium, and Bacillus aertrycke (B. pestis caviae), F. P. MATHEWS (*Jour. Amer. Vet. Med. Assoc.*, *73* (*1928*), *No. 5, pp. 608–611, fig. 1*).—This is a contribution from the Indiana Experiment Station.

"Antisera for *B. pullorum* and *B. gallinarium* agglutinated five out of seven strains of *B. aertrycke*. The agglutinins produced by the five aertrycke strains were separated into two parts by absorption with *B*[*acillus*] *paratyphosus* B. The unabsorbed agglutinin appeared identical with that produced by *B. pullorum* and *B. gallinarium*. Eight out of twelve hens injected with five strains of *B. aertrycke* were immune to *B. gallinarium*. Two strains of *B. aertrycke* exhibited antigenic properties resembling those of *B. paratyphosus* B. Four hens injected with these two strains of *B. aertrycke* were not immune to *B. gallinarium*."

The fermentation of maltose by Bact. pullorum, P. R. EDWARDS (*Jour. Bact.*, *15* (*1928*), *No. 4, pp. 235–243*).—In investigations conducted at the Kentucky Experiment Station the author has found that *B. pullorum* may produce acid in maltose broth upon prolonged incubation, even though the maltose used in the tests was not heated. When unheated maltose solution is added to serum water which has been previously sterilized, *B. pullorum* does not ferment the sugar within 24 hours. The results obtained indicate that *B. pullorum* does not attack dextro-maltose, but that it may produce acid from some of the products resulting from the alkaline hydrolysis of maltose.

Experiments on the virus of fowl plague, II, C. TODD (*Brit. Jour. Expt. Path.*, *9* (*1928*), *No. 2, pp. 101–106*).—This second contribution (E. S. R., 59, p. 581) deals with the production of active immunity to fowl plague.

"Attempts to immunize fowls against fowl plague with heated virulent materials (blood, spleen, etc.) gave entirely negative results. Attempts to immunize with the formalinized virus were also unsuccessful. A solid immunity against the disease can be constantly produced in fowls by the use of a phenol glycerine vaccine prepared from the liver of birds dead of the disease. In order to insure immunity three doses of the phenol glycerine vaccine, given at intervals of approximately a week, appear to be required. An apparently equally satisfactory vaccine can be prepared by the use of tricresol in place of phenol in the above vaccine. Fowls immunized with three small doses of the vaccine show no noticeable symptoms on the subsequent injection of a dose of the virus at least 300,000 times that required to kill a normal fowl. Birds immunized with a vaccine prepared from the English strain of the virus were found to be immune against the Dutch (de Blieck), the French (Staub), and the German (Miessner—goose) viruses."

Salmonella pullorum infection in rabbits, J. F. OLNEY (*Jour. Amer. Vet. Med. Assoc.*, *73* (*1928*), *No. 5, pp. 631–633*).—This contribution from the Nebraska Experiment Station reports upon the loss of 125 rabbits that had been fed infertile eggs containing *S. pullorum* after having been incubated for 18 days. The eggs, which were obtained from a commercial hatchery, were fed raw, mixed with the grain mash. The loss occurred within 3 or 4 days after feeding. Cultures from the heart, liver, and spleen of each of seven rabbits were obtained on plain agar, and all gave typical *S. pullorum* reactions on the five sugars used. Normal rabbits that were injected intravenously with the blood from infected rabbits succumbed.

Mortality in chickens following the feeding of massive doses of virulent fowl typhoid bacteria, W. V. LAMBERT and C. W. KNOX (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 4, pp. 480–483*).—The authors report upon experimental work conducted at the Iowa State College in which massive doses of the fowl typhoid organism were fed. The work was conducted over a period of 3 years with Single Comb White Leghorns ranging in weight from 2 to 3 lbs. The birds in the first two years were given 6 cc. of a 20-hour infusion broth culture of the organism, and females in the third year 3 cc. of culture, it being administered by means of a catheter inserted into the crop to insure that each bird received an equal amount of the same culture.

Of 220 birds inoculated during the 3 years, 47.7 per cent died, the mortality varying in different years from 55.1 per cent in 1924 to 41.8 per cent in 1925. The details, which are presented in tabular form, show that 63 of the 105 birds died between the sixth and fifteenth days. From the fifteenth to the twenty-fifth day the mortality was still quite heavy, after which it rapidly diminished. One bird died on the fifth day after infection and one on the forty-seventh, the latter being a chronic case which upon autopsy showed mild lesions of typhoid.

Many of the birds that recovered were later used in the breeding flock, their production and hatchability having been equal to those of similarly bred birds that had not been subjected to the disease.

The authors consider the virulence of the infecting organism to be one of the most important factors influencing the mortality. In the work conducted this was controlled as completely as possible, only an organism that had killed at least 75 per cent of the birds to which it was fed having been made use of.

The inheritance of resistance to fowl typhoid in chickens, W. V. LAMBERT and C. W. KNOX (*Iowa State Col. Jour. Sci., 2 (1928), No. 3, pp. 179–187, fig. 1*).—The authors found that chicks hatched from parents both of which had survived an acute infection of fowl typhoid gave a total mortality of 40.9 per cent, and that chicks whose sire only had survived such an infection showed a mortality of 62.4 per cent, while chicks from nontested parents showed a mortality ranging in different breeds from 82.5 to 98.1 per cent. The mortality rate in the groups from nontyphoid-tested parents was also much greater than that in the other two groups. The mortality rate in the chicks with single typhoid ancestry was greater than that of chicks with double typhoid ancestry. Evidence is presented to show that the lower rate of mortality in the chicks hatching from typhoid-surviving parents can not be due to chance alone. Significant differences were noted in the mortality of different breeds, but it is suggested that these represent strain rather than breed differences. Multiple factors are undoubtedly concerned in determining resistance to fowl typhoid in chickens.

A preliminary note regarding the presence of Davainea proglottina in Washington, J. W. KALKUS (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 5, pp. 612–616, figs. 5*).—This tapeworm, which first came to the author's attention in Washington State as a parasite of an occasional bird in 1923, has increased in abundance and threatens to become a serious pest of poultry in western Washington, where the mild, damp climate favors development of common garden slugs (probably *Limax cinereus*), its immediate host. This tapeworm is said to have been recorded by Ransom as occurring in Pennsylvania and Maryland (E. S. R., 23, p. 488).

Report of an outbreak of poisoning in the domesticated fowl, due to death camas, K. W. Niemann (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 5, pp. 627–630, fig. 1*).—This is a contribution from the Kansas Experiment Station on the loss of poultry that had fed on *Zygadenus* sp. Infected birds showed cerebral symptoms as evidenced by incoordination, dizziness, staggering gait, prostration, and coma. The birds were said to have survived only from 24 to 48 hours after the first symptoms were observed. From 5 to 10 gm. of the plant ground in a mortar and fed to a Single Comb White Leghorn cockerel produced marked symptoms of poisoning in 12 hours and caused its death on the nineteenth day.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Alabama Station] (*Alabama Sta. Rpt. 1927, pp. 21–23*).—In a continuation of the study of the fundamental factors influencing the traction of wheel tractors, by J. W. Randolph and M. L. Nichols, correlations were established between laboratory data and field results with actual tractors. In plaster cast studies of force distribution in soils a comparatively close check was obtained between calculated and actual distortion. The weight on the wheel and the depth of the lug are functions of the direction and amount of soil distortion. Shear in the soil takes place perpendicularly to the resultant of lug and rim displacement. By taking advantage of the arch action of the soil the lines of shear can be given greater distortion through the soil, resulting in a greater drawbar pull by the tractor.

Studies, by Nichols, of the physical properties of the soil as they affect tillage implement design showed that the adhesive properties of the metal could be varied by various heat treatments. Rapid cooling in mercury gave the lowest adhesion.

An electric sterilizer for dairy utensils was developed by Nichols, consisting of a float which could be attached to a Bayonet heater and which kept the heating coil immersed, thus giving a minimum amount of water to be heated and a maximum of steam.

In studies of solar water heating, A. Carnes developed a device which uses the energy of the sun for heating water for household and dairy purposes. This consists of three 30 by 60 in. sections built of corrugated roofing riveted to flat roofing and so arranged that the water would pass between the two middle surfaces. The heater was covered with glass, and the heated water was stored in a gravity tank of 500-gal. capacity. The water temperature obtained in the months of August, September, and October ranged from 90 to 150° F., providing water in sufficient quantities for the use of a dairy of 30 cows.

In studies of the requirements of farm machinery, Nichols found that the requirements of a riding cultivator are that the pipe gang is best adapted to the plants grown on a bed or in the water furrows, as it permits adjustments for "dirting" in the same manner as the Georgia Stock. The further requirements for the riding cultivator are that it should have a fairly high wheel, and, preferably, pivot axle control. It was found that the walking cultivators used in this section have the required adjustments, although these were lacking in many of the riding cultivators.

Labor studies showed that next to the cultivator the combination planter and fertilizer distributor was the most valuable tool. The requirements of agriculture were best met by the Lister type planter developed for southwestern conditions.

Ground water in the New Haven area, Connecticut, J. S. Brown (*U. S. Geol. Survey, Water-Supply Paper 540 (1928), pp. VI+206, pls. 15, figs. 19*).—This report, prepared in cooperation with the Connecticut State Geological and Natural History Survey, deals with the geology, physiography, and general character of the ground water in the New Haven area.

Drainage record and ground water movement (*Florida Sta. Rpt. 1927, pp. 114–117, fig. 1*).—Data on the control of ground water level in Everglades soils are presented and briefly discussed.

Wind pumping for pumping water, M. J. Thompson (*Minnesota Sta., Duluth Substa. Rpt. 1926–1927, p. 40*).—In 1926 the windmill at the substation, installed 13 years previously, was effective 81 per cent of the time, barring an occasional accident.

The economic limit of pumping for irrigation, W. L. Powers (*Oregon Sta. Bul. 235 (1928), pp. 48, figs. 30*).—Studies are reported which show that the soils best suited to supplemental irrigation in the Willamette Valley of Oregon are those that are free working. Crops found to give best response to supplemental irrigation in the valley are the truck crops, crops grown for intensive dairying, and row crops that make their maximum growth late in the season. Potatoes and beans have been found to give large returns from irrigation. Data are given on the available water supply and the types of pumping equipment best adapted for use in the valley.

Building an electric dairy cold storage, W. T. Ackerman (*N. H. Univ. [Agr.] Ext. Circ. 85 (1928), pp. 15, figs. 7*).—Practical information on the construction of an electrical refrigerating apparatus for use in dairies is presented.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Alabama Station, 1926–27] (*Alabama Sta. Rpt. 1927, pp. 20, 21, 25*).—Results of studies are reported upon as follows:

A study of local cotton marketing, J. D. Pope (pp. 20, 21).—Government classification of samples from 5,107 bales of the 1926 crop collected at 16 representative towns showed that 54 per cent of the bales were above middling in value, 20 per cent middling, and 26 per cent were below middling. Comparisons of Government and local buyers' grades of 305 bales in one town showed that the Government gradings averaged 161 points higher than the local buyers' gradings. The range of prices paid by six buyers in six towns for middling cotton in one day was found to be 475 points, as compared with a range of 31 points in New York futures.

[Cost of producing oats], J. F. Duggar (p. 25).—The cost of producing oats in 1926 on central and eastern county farms varied from less than 25 cts. to over 70 cts. per bushel. Yield per acre was the chief factor affecting cost of production.

[Rural economics investigations at the Ohio Station], J. I. Falconer (*Ohio Sta. Bimo. Bul., 13 (1928), No. 5, pp. 191, 192, fig. 1*).—Under the title of Farm, Wholesale, and Retail Food Prices, a chart is given showing the courses of the retail and wholesale food prices and the farm price of farm products, 1910–1927. Under the title of Index Number of Production, Wages, and Prices the table previously noted (E. S. R., 59, p. 783) is brought down through May, 1928, and a new index on Ohio cash income from sales is added.

Lessons from southwestern Indian agriculture, S. P. Clark (*Arizona Sta Bul. 125 (1928), pp. 233–252, figs. 14*).—Some of the agricultural practices of the Hopi, Zuni, Navajo, and Papago Indians are described.

Ranch organization and methods of livestock production in the Southwest, V. V. Parr, G. W. Collier, and G. S. Klemmedson (*U. S. Dept. Agr., Tech. Bul. 68 (1928), pp. 104, figs. 34*).—This bulletin contains information on the organization and management of range-cattle, sheep, and goat ranches, based upon ranchmen's experience and a study of the details of one year's business on 204 ranches running breeding cows exclusively, 7 steer ranches, 10 sheep ranches, 14 combination cattle and sheep ranches, and 5 Angora goat ranches in Arizona, New Mexico, and the part of Texas west of the Pecos River. In presenting the data the cow ranches are divided according to location—western Texas, northeastern New Mexico, and Arizona and New Mexico on "controlled range," and Arizona and New Mexico using the public domain, and into six classes according to the number of breeding cows on the ranch.

The study was made in cooperation with the State agricultural experiment stations of Arizona, New Mexico, and Texas.

The business side of dairying, W. C. Jensen and B. A. Russell (*South Carolina Sta. Bul. 249 (1928), pp. 72, figs. 12*).—This bulletin reports the results of studies begun in 1924 of the business side of dairying in the Upper Piedmont, Lower Piedmont, Sand Hills, Middle Coastal Plains, and Coastal Flatwoods regions of the State. It is based upon detailed records of 115 dairy farms, 375 farm management records of farms on which dairying was a minor enterprise, census and other statistics, interviews with farmers, and market facts furnished by business men and transportation companies.

The status of the dairy industry in the State and in the United States, the types of farming in the State in relation to dairying, the ability of the dairy industry in South Carolina to compete with other sections, and the outlook for the industry in the United States and South Carolina are discussed. The records obtained from dairy farms are analyzed, and data presented as to farm organization, investments, feeding methods and requirements, pastures, expenses, receipts, incomes, and other factors making for the success of the industry on dairy farms in the Piedmont and Coastal Plains areas. Using the records obtained from the farm management studies, the place of cows on the usual farms in the two areas is discussed.

Appendix tables present data showing for different periods by counties the number of cows and other cattle; milk production; sales of milk, cream, butter, and butterfat; acreage in farms; acreage of improved land; acreage in different crops; production of different crops; number of work stock and livestock other than cattle; and population.

Public revenue in Ohio with especial reference to rural taxation, H. R. Moore and J. I. Falconer (*Ohio Sta. Bul. 425 (1928), pp. 41, figs. 7*).—The sources of State, county, township, school district, and municipality revenues in Ohio and the services supplied by the funds collected by the several units are described, with tables covering a period of years, and discussed. The total and per capita revenues collected for the State and local units increased 260 per cent and 179 per cent, respectively, from 1913 to 1926. The general property tax was the source of from 73.25 per cent to 78.74 per cent of all revenues from 1916 to 1926. Of the total revenues approximately 40 per cent was spent for education and 26 per cent for roads.

A more detailed study of the property tax showed that the total collections in municipalities and outside of municipalities increased 259 and 127 per cent, respectively, from 1913 to 1926, and the percentages of total collections rose from 68 to 77 per cent in the municipalities and decreased from 32 to 23 per cent outside of municipalities. The total tax per capita increased from $17.41 to $48.13 and from $15.71 to $39.49, respectively.

The average ratios for the State of tax valuation to sale valuation of real estate were 77.16 and 62.64 per cent, respectively, for farm and for city and village real estate before and 83.00 and 83.78 per cent, respectively, after the 1925 reappraisement. A study in eight counties showed variations of from 14.8 to 59.9 per cent between assessed valuation of real estate in the high and the low appraised townships of the different counties. Comparison of assessed valuations in percentages of sale prices, 1923–1927, in different sale price groups in four counties showed the average for the four counties increased with slight irregularities from 69 per cent for the $9,000 and over group to 98.5 per cent for the below $1,500 group.

A table is included showing for 1913 to 1926, inclusive, the indexes of total revenues, State revenue, local revenue, and the general property tax in different units and areas, measured in current dollars, adjusted to dollars of 1913 purchasing power, and adjusted for both price and population changes.

Farm credit in a plantation and an upland cotton district in Arkansas, B. M. Gile and A. N. Moore (*Arkansas Sta. Bul. 228 (1928), pp. 50, figs. 11*).—This report describes and analyzes the credit conditions and practices in the Altheimer and Rison districts in eastern Arkansas, the former being representative of the plantation type and the latter of the small farm or upland type of farming.

The data used were obtained from county records and by personal canvass of farmers, bankers, and merchants. Three local banks, 2 banks in the city of Pine Bluff, and 14 merchants cooperated, and 44 usable farm records, of which 19 were from owner-operated cotton plantations and 25 from renters and croppers in the Altheimer district, and 75 usable records in the Rison district were obtained. A complete record of farm real estate mortgage activity from 1913 to 1927, inclusive, was also obtained from the county records for Dunnington Township in the Altheimer district. The farm surveys covered property values, crop and livestock production, and income for 1926; historical data on crop acreages, production, and total crop value from 1923 to 1926, inclusive; sources, terms, and rates of interest on investment credit; cash loans on personal and collateral security from banks, landlords, and other sources; and credit for time purchases of supplies, equipment, and livestock.

Tables are given and discussed showing the sources and changes in sources from 1915 to 1926, inclusive, of long-term credit and the sources of short-term credit; volume and changes in volume of loans and purposes for which loans were used; and the costs and terms of loans from different sources for different types of credit and to different classes of borrowers. The basis of credit and the changes in the financial status of the farmers of the two districts are discussed.

In the upland district the Federal land bank supplied 40 per cent and private individuals 39 per cent of the farm mortgage loans. In the plantation district joint-stock land banks supplied 53 per cent and insurance and mortgage companies 44 per cent. The rates of interest charged for loans from different sources were Federal land banks 5.5 per cent, joint-stock land banks 6 per cent, insurance companies 7 per cent, mortgage companies from 6 to 10 per cent, commercial banks 8 per cent for the larger loans and 10 per cent for the smaller loans, and private sources 10 per cent. For short-term loans in 1926 the average rates were as follows: In the plantation district on bank loans to owners 7.7 per cent, bank loans to share tenants 10 per cent, and on loans from other sources, chiefly supply merchants, to owners 20 per cent, to small share tenants 39 per cent, and to croppers 44 per cent. In the upland district the charges on loans from banks were 10 per cent, and on loans from other sources to owners 18 per cent, to share tenants 19 per cent, and to croppers 21 per cent.

Lack of tangible assets, lack of knowledge of the Federal land and joint-stock land banks, or failure or inability to use them, uncertainty of crop values, lack of standards of appraisal of both long and short term credit, and the large use of credit for current personal consumption were found to be some of the more important factors tending to keep the cost of credit high.

Relation of farm prices to quality of cotton, G. L. Crawford and L. P. Gabbard (*Texas Sta. Bul. 383 (1928), pp. 29, figs. 4*).—This is a preliminary report of the first year's work (1926) of a study being made in cooperation with the U. S. D. A. Bureau of Agricultural Economics to determine the quality of cotton being produced in different sections of Texas, to what extent local market prices are based on quality, and to what extent central market values are reflected in local prices. Data as to grade, staple, character, price, etc., were collected regarding 408 bales marketed at Robstown, representative of south Texas; 938 bales at Henderson, representative of east Texas; 694 bales at Lubbock, representative of west Texas; and 478 bales at Hillsboro, representative of the black waxy prairie belt.

Tables are given showing for each of the markets the distribution of the bales by grades for the year and by months, by staple lengths for the year, average monthly price of lint by grades, and length of staple of 2,518 bales, and the average spread between local and central market values by grades and length of staple of 1,702 bales. The data for local market prices show a slight but not a uniform or consistent tendency of buyers to recognize grade differences. Very little, if any, recognition was given to staple length. Buying in local markets was generally done on an average basis, which places a premium on cotton below the average and penalizes that above the average, and results in many growers growing varieties of shorter staple and higher yields.

The average spread and the price per bale for the 1,702 bales between the local market and the Houston quotations were $1.10, $2.43, $3.51, and $6.65, respectively, for Hillsboro, Henderson, Robstown, and Lubbock, and the average handling charges—freight and compress, interest, exchange, insurance, and drayage—were $4.49, $4.49, $4.62, and 5.48, respectively.

For grades from middling to low middling, inclusive, a rather uniform spread, averaging about $3.25 per bale, obtained between the local price and the quoted price on the Houston market, less certain handling charges. For other grades there was usually a much wider spread, averaging about $5.35. There was a decided tendency for the spread to widen with an increase in staple length, the average spread for different lengths being as follows: ¾ in., 74 cts.; $\frac{13}{16}$ in., —$1.56; ⅞ in., $4.26; $\frac{15}{16}$ in., $3.50; 1 in., $3.93; $1\frac{1}{32}$ in., $5.86; $1\frac{1}{16}$ in., $7.20; $1\frac{3}{32}$ in., $8.17; and 1¼ in., $8.09.

Tables showing staple differences used in calculating central market value of cotton of different grades are given in the appendix.

Statistics on the prices and destinations of Idaho apples, C. F. Wells (*Idaho Sta. Bul. 162 (1928), pp. 15*).—Statistics are given showing by varieties, grades, and packs the volume, value, prices received by producers, and destinations by districts of the United States of car-lot shipments of the 1923 to 1926 crops of Idaho apples.

Oranges, H. R. Wellman and E. W. Braun (*California Sta. Bul. 457 (1928), pp. 58, figs. 22*).—Tables and graphs are presented and discussed showing the acreage, production, seasonal shipments, and prices and purchasing power of California Valencia and Navel oranges and Florida oranges; the foreign production and foreign trade of the United States in oranges; and the seasonal movement of fresh fruits competing with California oranges.

The future of the industry is analyzed, and conclusions are reached that future increased returns will depend largely on more efficient production and that new plantings should be made only under favorable conditions and where high yields of good quality fruit can be expected.

The feed-purchasing power of a hen's egg production, H. L. KEMPSTER (*Missouri Sta. Bul. 261 (1928), pp. 14, figs. 7*).—Tables are presented showing by months from 1910 to 1927, inclusive, the farm prices per bushel of corn, wheat, and oats, and per 100 lbs. of feed (5:3:3 mixture by weight of corn, oats, and wheat), and the farm price of eggs per dozen.

Using the 8-year average monthly distribution of egg production of the Missouri demonstration farm poultry flock for the 122-egg hen and the estimated distribution of the Missouri office of the Bureau of Agricultural Economics, U. S. D. A., for the 93-egg hen, tables and graphs are presented showing by months and years the pounds of feed a 122-egg hen would purchase from 1910 to 1927, a 93-egg hen from 1918 to 1927, and the average for the demonstration farm flock hen for each year from 1918 to 1927. The number of pounds of feed the annual egg production would purchase during the period 1918–1927 varied as follows: 93-egg hen from 91 to 143 lbs., averaging 112.5 lbs.; 122-egg hen from 119 to 191 lbs., averaging 148.4 lbs.; and the farm demonstration flock hen from 101 to 205 lbs. Assuming an annual feed consumption of 72 lbs. of feed for the 122-egg hen and 60 lbs. for the 93 egg hen, two of the former made as much profit as three of the latter.

A graph is included showing by years from 1910 to 1927 the number of dozen eggs required to purchase 100 lbs. of feed.

The livestock review for 1927, H. M. CONWAY (*U. S. Dept. Agr., Misc. Pub. 28 (1928), pp. 45, figs. 6*).—This review presents a perspective of basic conditions in the livestock industry; an analysis of the short-time variations and the general trend of market supply, demand, and prices in 1927 of cattle, calves, hogs, sheep, lambs, and their products; and an interpretation of the livestock situation and of the basis of statements in The Agricultural Outlook for 1928 (E. S. R., 58, p. 782).

Tables are included showing by years the number, weight, and cost of cattle, calves, hogs, and sheep and lambs slaughtered under Federal inspection, 1921–1927; the relative farm prices and relative purchasing power of meat animals, wool, and feeds by years, 1910–1927, and by months, 1927; by months, 1926 and 1927, and usually by years for longer periods, the receipts and prices at different markets for beef cattle and calves, hogs, and sheep and lambs of different classes and weights; and the wholesale prices of western dressed fresh steer beef at New York, stocker and feeder steers at Chicago, packer hides at Chicago, fresh and cured pork products at New York, western dressed lamb at New York, wool at Boston, and other data.

Crops and Markets, [September, [1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 9, pp. 321–360, figs. 3*).—Tables, graphs, notes, reports, and summaries of the usual types are included, together with special articles on the cattle outlook, August, 1928, and the winter wheat outlook, 1929.

Farmers' cooperative buying and selling organizations in Michigan, C. F. CLAYTON and J. T. HORNER (*Michigan Sta. Spec. Bul. 171 (1928), pp. 104, figs. 30*).—This bulletin presents the results of a study to obtain preliminary data regarding the economic, financial, and business aspects of cooperation in Michigan. It is based upon data obtained by visits during 1925 to 486 associations, of which 128 were grain and bean marketing, 138 livestock shipping, 70 dairy products, 70 potato shipping, and 22 fruit shipping associations, 40 cooperative stores, and 9 supply associations.

Maps are given showing the distribution of the different types of associations. The Michigan laws pertaining to cooperative organizations are discussed, and tables and graphs included showing for each type of association the number organized under different laws, changes from organization under one act to organization under another act, number of stock and nonstock associations, changes from nonstock to stock associations, and years of operation of associations operating in 1924. The organization and membership of central exchanges of which the associations are members are discussed, with a brief description of the organization, membership, purposes, operation, management, and volume and kind of business of the leading central exchanges.

The objectives and advantages of cooperation, and the functions of management and of the board of directors and manager are discussed briefly. Fuller analyses and discussions are given of the problems of membership, sources and utilization of capital, volume and character of business, buying, selling, and control of quality for associations in general and for associations organized for different purposes.

Of the 383 associations reporting as to past difficulties, 29.2 per cent reported difficulties due to management, 26.4 per cent to financing, 6.3 per cent to organization, 29.8 per cent to membership, 19.1 per cent to operation, 34.2 per cent to competition, and 7.8 per cent to economic conditions, and 8.6 per cent reported no past difficulties. For the 325 associations reporting as to causes of present difficulties, the percentages were management 11.1, financing 24.6, organization 7.7, membership 30.5, operation 13.9, competition 32.3, and economic conditions 2.8, and 12.6 per cent reported no present difficulties.

The outlook for cooperation in the State is discussed briefly.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Agricultural and home economics extension in the United States: A selected list of references, compiled by C. L. Feldkamp (*U. S. Dept. Agr., Library, Bibliog. Contrib. 18 (1928), pp. [5]+56*).—This is a mimeographed selected list of references covering the different types and phases of extension work and the work done in the several States.

Outlines of biochemistry, R. A. Gortner (*[University Farm, St. Paul: Author], 1927, pp. [2]+190, figs. 10*).—This is an outline, in mimeographed form, of a lecture and laboratory course in biological chemistry based upon the experience of the author and his associates at the University of Minnesota. Much of the illustrated material with respect to biochemical processes is drawn from plant sources, but "it must be remembered that, in the last analysis, the chemistry of the cell is essentially the same, both for plants and animals."

Science of dairying, W. A. G. Penlington (*London: Macmillan & Co., 1927, 2. ed., pp. VIII+274, figs. 88*).—This is a textbook for secondary and technical schools covering milk testing, dairy chemistry, breeding, feeding, butter and cheese making, diseases, and dairy arithmetic.

[Marketing education], F. M. Clement (*Sci. Agr., 9 (1928), No. 1, pp. 39–50*).—This is a report of the committee on marketing education presented to the eighth annual convention of the Canadian Society of Technical Agriculturists at Quebec, June 11, 1928, and sets forth the replies by university men, Government officials, and business men to a questionnaire covering the training needed, courses offered at present, courses and type of instruction recommended, and the relation of marketing education to business.

FOODS—HUMAN NUTRITION

Nutrition laboratory, F. G. Benedict (*Carnegie Inst. Wash. Yearbook 26 (1926–27), pp. 139–147*).—This annual report contains, as previously (E. S. R., 56, p. 791), a brief outline of investigations in progress and abstracts of publications of the laboratory during the year, several of which have been noted from their original sources.

Continuation and extension of work on vegetable proteins, T. B. Osborne and L. B. Mendel (*Carnegie Inst. Wash. Yearbook 26 (1926–27), pp. 351–358*).—This is the annual progress report (E. S. R., 57, p. 89) of the investigations of the authors and collaborators on various nutritional problems, including the relation of the rate of growth to diet (E. S. R., 58, p. 592), the preparation of satisfactory synthetic diets for the study of changes in the development of the bones as the result of alterations of single factors in the food, histological examination of the organs and tissues of rats on various diets, and methods for separating histidine from arginine (E. S. R., 58, p. 409).

Composition and nutritive value of Philippine food fishes, A. Valenzuela (*Philippine Jour. Sci., 36 (1928), No. 2, pp. 235–242*).—Data are reported on the percentage of edible and nonedible material and the composition of the edible portion of 40 species of fresh fish found in Philippine waters, 6 of preserved fish, and a few common varieties of shell fish (crustaceans and mollusks).

The average values obtained for the protein (N×6.25) were fresh fish, 20.15; smoked or dried fish, 44.92; shrimps, 22.7; lobsters, 21.64; crabs, 12.79; clams, 9.68; oysters, 6.76; squid, 18.39; plain roasted bañgos or milkfish, 30.29; and bagoong alamang, a partly fermented Philippine food made from small shrimps, 12.45 per cent.

Calculations of the caloric value per 100 gm. of fresh edible portion are also given. These varied from 145.5 calories per 100 gm. for mayamaya or red snapper to 72.7 calories for anchovy.

The nutritive value of haddock and herring (Clupea harengus), M. C. Kik and E. V. McCollum (*Amer. Jour. Hyg., 8 (1928), No. 5, pp. 671–693, figs. 8*).—A study is reported of the protein values as determined by the method of McCollum, Simmonds, and Parsons (E. S. R., 46, p. 161), and of the content of vitamins A, B, and D in herring and haddock.

At levels of 9 and 15 per cent both the haddock and herring protein proved of sufficiently good quality to promote growth and well being for extended periods in rats on diets otherwise adequate. The supplementary value of herring protein for cereal proteins was found to compare favorably with that of steak, liver, and kidney and to be somewhat higher than that of haddock. Neither protein supplemented the proteins of legumes to any extent, but haddock appeared to be slightly higher than herring in this respect. The body oils of both herring and haddock contained vitamins A and D, herring being considerably richer than haddock. Neither haddock nor herring was a good source of vitamin B.

Bacterial flora of ground market meats, J. C. Geiger, F. E. Greer, and J. L. White (*Amer. Jour. Pub. Health, 18 (1928), No. 5, pp. 602–606*).—Attention is called to indications that members of the paratyphoid enteriditis group, many of which can not be classified with any of the better known organisms, may be responsible for outbreaks of gastrointestinal nature induced by unsatisfactory sanitary handling of foods. An outbreak of food poisoning in Chicago was traced to crab meat which was found to be contaminated with a strain of *Salmonella suipestifer*, and several similar microorganisms were identified in the flora from meat obtained in a Chicago market.

Chemical composition of mustard and turnip greens and losses of iron in cooking, A. M. Field, M. T. Peacock, E. Cox, and I. P. Earle (*West. Hosp. and Nurses' Rev., 11 (1928), No. 5, pp. 26–28*).—Data are presented on the chemical composition, including total ash, calcium, phosphorus, and iron, of turnip greens, mustard greens, and spinach, and on the losses of iron in cooking turnip and mustard greens in various ways. The method used for the iron determinations was moist oxidation followed by colorimetric estimation with thiocyanate, the technic including certain modifications of variations in the method reported in the literature.

A comparison of the data for turnip and mustard greens with similar data for spinach as obtained by the authors and noted in the literature showed that both vegetables compared favorably with spinach in all respects and were markedly higher in calcium and iron. When cooked in varying quantities of distilled water for 45 minutes, the losses in iron varied from 5 to 25 per cent, depending upon the volume of water used. Tap water (the city supply of Nashville, Tenn.) caused more than twice as great a loss of iron as was caused by an equal volume of distilled water.

Canning of non-acid vegetables, O. D. Abbott (*Florida Sta. Rpt. 1927, p. 91*).—In continuation of the attempts to determine the cause of spoilage of nonacid vegetables in the South (E. S. R., 56, p. 894), vegetables have been canned in the laboratory in a pressure cooker according to the directions sent out by the Bureau of Home Economics, U. S. D. A. (E. S. R., 55, p. 189), and an examination has been made of spoilage in the products thus canned and in products canned in the home by the pressure cooker method. In the laboratory canned products the only spoilage was caused by leakage due to poor rubbers and this amounted to less than 2 per cent. Much of the spoilage in the products sent to the laboratory was also due to leakage, but in some of the jars flat sour organisms were obtained which are now being studied.

Nutritional survey, O. D. Abbott (*Florida Sta. Rpt. 1927, pp. 90, 91*).—This brief progress report on the nutritional status of children between the ages of 6 and 16 years includes data from three counties on the percentages of underweight, diseased tonsils, eye diseases, caries, and hookworm, with estimates from food lists submitted for six consecutive meals of the proportion of the children in the different counties using milk, butter, fruit, and vegetables. No conclusions have been drawn as yet.

Studies in nutrition, I, II, M. S. Rose and E. L. McCollum (*Jour. Biol. Chem., 78 (1928), No. 2, pp. 535–555, figs. 2*).—These papers report the first two of a series of studies in which the authors, with the cooperation of R. E. Evans and E. M. Bloomfield, have tested the nutritive value of various diets for children by feeding experiments on rats through several generations. The general plan was to start with four lots of rats from stock bred and reared on the Sherman diet 13 and started on the experimental diet at the age of 28 days. Two lots were composed of 1 male and 2 females, and two of 1 male and 1 female each. Animals from the same litter were represented in the lots on each diet. All of the young were kept with their mothers until 28 days of age, when two lots of 1 male and 2 females each were selected from healthy animals of medium size and continued on the same diet. This procedure has been followed into the fifth generation, but the records reported were chiefly for the first three generations. All of the animals kept for breeding were killed and autopsied at the age of 12 months.

I. *Growth, reproduction, and lactation on diets with different proportions of cereals and vegetables* (pp. 535–547).—The diets compared in this study were composed of food materials similar to those found in the diets of normal children and differing only in the proportion of cereals (white flour) and vegetables (potatoes, spinach, tomatoes, carrots, onions, and dried peas), the peas being limited to quantities not exceeding 3 per cent of the total calorie intake. In the three diets studied, flour furnished 50, 37.5, and 25 per cent of the calories and the vegetable mixture 10, 15, and 20 per cent, respectively. Each of the diets included whole milk powder to the extent of 25 per cent of the total calories, dextrin 5, 9.5, and 12 per cent, a butter substitute containing vitamin A 8, 10, and 12 per cent, and meat residue 2, 3, and 5 per cent, respectively. In the third generation, 127 animals were carried to the age of one year and 871 to the age of 4 weeks.

The food consumption was very uniform on all of the diets and the general health and gains in weight exceeded the Donaldson normal curves. There were more infertile matings on the diet highest in white flour, but there was no significant difference in the age of the mothers at the birth of the first young. On each diet reproduction was better, but lactation poorer, in successive generations. It is thought that the limiting factor is vitamin B.

II. *The effect of adding egg to a diet already adequate* (pp. 549–555).—In this study, which was occasioned by the favorable results obtained on supplementing the diet of a group of children by an egg a day for each child (E. S. R., 57, p. 688), the median diet of the first study, having 37.5 per cent of its calories in the form of white flour, was compared with the same diet with sufficient whole egg added to represent one egg a day in the diet of the child or 3 per cent of the total calories. The egg diet proved equal to the three diets used in the preceding study in the number of young born and the weight of the young at 28 days and superior to these diets in the growth of the young from the twenty-eighth to the fifty-sixth day, in the age at which the females matured, in the number of females bearing young, and in the capacity of the mothers to suckle their young.

In view of the fact that in the experiment with children the egg appeared to improve the blood in respect to hemoglobin percentage and erythrocyte count, similar determinations were made on the blood of the rats of the second and fourth generations at the age of 6 weeks and 2½ months. No differences, however, were observed, thus indicating that all of the diets were adequate in this respect. In attempting to explain the favorable action of the egg, the possibility is suggested that it supplies an additional factor necessary for successful lactation, as suggested by Evans and Burr (E. S. R., 59, p. 489), and that this may also account for superior growth.

Supplementary values among foods.—II, Growth and reproduction on white bread with various supplements, M. S. Rose and G. MacLeod (*Jour. Nutrition, 1 (1928), No. 1, pp. 29–38, figs. 4*).—The plan followed in this experiment was essentially the same as in the studies noted above (the preliminary report of one of which constituted paper 1 in this series), except that the feeding was not continued beyond the second generation. Six series of experiments were conducted, using as supplements to white bread whole milk powder at two different levels, egg, carrot, spinach, almond, and lean beef. Three kinds of bread were used, a commercial product containing some milk and two specially prepared breads differing only in that one was made with fluid milk and the other with water. No marked differences attributable to the differences in the bread were noted, however.

On a diet composed of dried bread 70 and dried whole milk 30 per cent, there was normal growth, excellent health, and satisfactory reproduction, but lactation was poor. Of 81 young produced by 4 females, only 5 were successfully weaned. On the same proportions of dried bread and egg powder similar results were obtained. Of the 68 young produced by 4 females, 12 were successfully weaned. Six of these made normal gains for periods of from 3 to 6 months, but the other 6 showed signs of general weakness and 3 of them died within 6 weeks.

Less satisfactory results were secured with bread 90 and milk 10 per cent and with bread 70 and carrots 30 per cent. Growth was poorer and young were borne by only 1 female on the carrot diet. These, however, were successfully weaned and made good growth on the bread and carrot diet during the 2 months they were under observation. On bread 70 and almond meal 30 per cent and bread 97, 95, and 90 per cent, with spinach 3, 5, and 10 per cent, respectively, the rats grew very poorly and did not reproduce. The poorest records of all were made with bread and lean beef, although there was fairly good growth for an initial period of 3 to 5 weeks. Only 8 of the 13 animals used were alive at the end of 8 months.

Influence of amount of milk consumption on the rate of growth of school children, J. B. Orr (*Brit. Med. Jour., No. 3499 (1928), pp. 140, 141*).—The relative value of whole milk, separated milk, and crackers as supplementary school lunches has been tested on a large scale in schools in seven cities and large towns in Scotland and in Belfast, Ireland. At each center four groups of from 40 to 50 children each were selected for the experiment. One group received whole milk in amounts of 0.75 pint per school day for the children 5 to 6 years old, 1 pint for those 8 to 9 years old, and 1.25 pints for those 13 to 14 years old. Another group received the same amounts of separated milk, and another crackers having the same energy value as the separated milk. A fourth controlled group received no supplemental lunch.

The experiment lasted for 7 months, during which time there were average monthly gains in height and weight of 0.17 in. and 0.42 lb., respectively, in the groups receiving no milk, and 0.21 in. and 0.52 lb. in the milk groups. There was no significant difference between the whole milk and separated milk. There was no gain in any of the children on the cracker group over the corresponding control, and in the groups of 13- and 5-year children there was a smaller gain than in the control groups of the same age. The increase in growth in the milk groups was accompanied by an improvement in the general condition of many of the children.

The results with the separated milk are considered especially significant as indicating that its nutritive value for children has often been underestimated.

The influence of feeding on certain acids in the feces of infants.—II, The effect of an excess of lactose in breast milk and in modified cow's milk, with observations on a parenteral infection, J. R. Gerstley, C. C. Wang, R. E. Boyden, and A. A. Wood (*Amer. Jour. Diseases Children, 36 (1928), No. 2, pp. 289–297, figs. 6*).—In this continuation of the investigation previously noted (E. S. R., 59, p. 489), an attempt was made to determine whether the differences observed in the intestinal fermentations in infants fed breast milk and cow's milk are due to quantitative differences in their carbohydrate content by adding definite amounts of lactose to breast milk and cow's milk mixtures and following the same procedure as in the preceding study.

Analyses of the feces showed that the addition of lactose to breast milk, even in amounts as high as 12 per cent, caused little change in the excretion of the volatile acids, the titrable acid, or the weight of the stools. Similar additions to mixtures of modified cow's milk caused only slight changes in the total excretion of the volatile acid, but increased considerably the amount of free acid and also the frequency and weight of the stools.

An intercurrent bronchitis in one of the infants on cow's milk was the cause of a much greater increase in acid excretion than any increase in the carbohydrate of the mixtures. These observations are thought to indicate that intestinal fermentations "are not primary but occur only after the development of some disturbance of nutrition."

The influence of the ingestion of methyl xanthines on the excretion of uric acid, V. C. Myers and E. L. Wardell (*Jour. Biol. Chem., 77 (1928), No. 2, pp. 697–722*).—In this extension of an earlier investigation by Mendel and Wardell of the effect of caffeine on the uric acid excretion (E. S. R., 37, p. 470), further studies have been made with caffeine and similar ones with theobromine (3, 7-dimethylxanthine) and theophylline (1, 3-dimethylxanthine), using several methods for the estimation of uric acid.

The ingestion of caffeine was always, and of theophylline usually, followed by an increase in uric acid, but there was no increase following the ingestion of theobromine.

"The origin of the increase in uric acid excretion observed after caffeine and theophylline has not been definitely ascertained. Stimulation of metabolism alone seems insufficient to account for all the extra uric acid, and it is suggested that the increase may be due, at least in part, to the transformation of caffeine and theophylline to uric acid or methyl uric acids."

The character of energy metabolism during work, M. E. Marsh (*Jour. Nutrition, 1 (1928), No. 1, pp. 57–89, fig. 1*).—A further investigation of the question of the source of energy in muscular work is reported in detail, with conclusions confirming the earlier belief of Zuntz that the body uses for the energy of muscular work both carbohydrate and fat, and recent results of Rapport and Ralli (E. S. R., 59, p. 391) and of other investigators that the proportion of carbohydrate to fat oxidized is essentially the same as before the work.

The data reported were obtained in over 100 experiments on 17 subjects on an uncontrolled supposedly normal diet and a few experiments on one of these subjects, a trained athlete, on special weighed high carbohydrate and high fat diets. Most of the experiments were conducted on this subject and on two boys 14 and 15 years old at the beginning of the experiment. Two types of ergometers were used with like results on the same subject and under like conditions. The work varied in intensity from 0.76 to 1.4 calories per minute and continued from 5 to 20 minutes. Special attention was paid to secure the proper length of recovery period to obtain complete recovery with respect to carbon dioxide as well as oxygen.

With one boy the respiratory quotient of excess metabolism occasioned by the work was lower than in the previous resting period in 41 out of 49 experiments and in the other in 15 out of 18 experiments, while in the mature athletic subject the excess metabolism in 15 out of 16 experiments was higher than in the previous resting period. The average excess respiratory quotient in the boys was 0.78 and in the man 0.95. On the high fat diet the recovery to previous levels was much slower than on the high carbohydrate diet. The alveolar values in these experiments on special diets showed more carbon dioxide in circulation at the end of work and recovery on high carbohydrate than previous to work and no change or less carbon dioxide in circulation at the same time on high fat. In 10 of the 17 subjects studied, the work performed did not alter the metabolism appreciably.

Your weight and how to control it, edited by M. Fishbein (*New York: George H. Doran Co., 1927, pp. XVIII+19–260*).—This volume is the outcome of the Adult-Weight Conference held in New York City in February, 1927, under the auspices of the American Medical Association. Part 1 consists of a series of articles on the relation of weight control to health, contributed by members of the conference and originally appearing as a series of articles in the *New York Herald Tribune*.

In part 2, by F. Rose and M. Henry, the essentials of nutrition with relation to diet and weight are discussed from the standpoint of fuels, building materials, and regulating substances. Diets and menus for gaining and reducing are given, with the necessary tables from various sources of 100-calorie portions, height-weight standards, etc.

The vitamins, R. K. CANNAN (*Sci. Prog. [London], 23 (1928), No. 89, pp. 23-29*).—A review of recent literature on the subject.

Factors affecting the accuracy of the quantitative determination of vitamin A, H. C. SHERMAN and M. P. BURTIS (*Jour. Biol. Chem., 78 (1928), No. 3, pp. 671-680*).—The extensive series of studies on vitamin A which have been reported from the senior author's laboratory and special studies hitherto not reported have been used as the basis for definite recommendations of procedure in the quantitative determination of vitamin A.

In the selection of the experimental animals, those from stock diet B are considered preferable to those from diet A furnishing a smaller amount of milk even though a slightly longer depletion period is required, one of the advantages being the greater resistance to infection as noted in the following paper.

As a source of vitamin D irradiated commercial cholesterol or some other form of irradiated ergosterol with or as a supplement to the basal diet has been found rather more satisfactory than irradiation of the animals or the cornstarch of the basal diet.

The depletion period is considered complete when growth has definitely ceased and the animal shows incipient signs of deficiency, but is not in a serious pathological condition. The size of the animal has been shown to bear an inverse relationship to its rate of gain upon a limited allowance of vitamin A. The limits set in this laboratory are a minimum of 70 to 75 gm. and a maximum of 100 gm. at the end of the depletion period.

Earlier experience indicating that males and females may be used interchangeably has been confirmed for the rate of growth adopted as standard. It is noted, however, that with larger amounts of vitamin A the difference in rate of growth of males and females may become significant. A comparison of the test periods of 8 weeks and 5 weeks showed greater variability in the shorter period and a tendency to increase by about one-sixth the numerical ratings of vitamin A. An examination of over 100 experiments on the two levels of 3 and 6 gm. gain per week showed a decrease in the delicacy of the method on the larger gains. "The present investigation therefore supports the continued use of the present unit rate of 3 gm. per week of gain in body weight in a standard test animal depleted of surplus bodily store of Vitamin A, as the basis for quantitative work in the determination of vitamin A by the rat growth method."

Vitamin A in relation to growth and to subsequent susceptibility to infection, H. C. SHERMAN and M. P. BURTIS (*Soc. Expt. Biol. and Med. Proc., 25 (1928), No. 8, pp. 649, 650*).—Supplementing the investigation noted above and previous studies on the effects of graded doses of vitamin A on experimental rats, the authors have determined the effect of the level of intake of this vitamin as present in dried milk on the incidence of infection.

Two groups of 38 and 37 rats, respectively, from stock on diet A (one-sixth dried whole milk and five-sixths whole wheat) and diet B (one-third dried whole milk and two-thirds whole wheat) were placed at 4 weeks of age on a vitamin A-free diet and kept on this diet for periods of about 1 month, or until the surplus store of the vitamin was depleted, and then for 8 weeks on identical limited allowances of a vitamin A-containing diet. Autopsies at the end of this period showed infection in 75 per cent of the rats on diet A and in only 25 per cent of those on diet B, containing the higher proportion of milk.

It is noted that the better diet was richer not only in vitamin A but also in vitamin G, in calcium, and in certain of the nutritionally important amino acids. In comparison with human beings it is noted that these results would indicate differences in susceptibility to infection among children of from 10 to 12 years of age resulting from differences in their diet before they were 3 years old.

Vitamin A, O. D. Abbott (*Florida Sta. Rpt. 1927, pp. 89, 90*).—In this progress report on a study of the effect of the intensity and time of illumination on the formation of vitamin A in alfalfa plants, it is noted that germinated alfalfa seed, alfalfa seedlings grown in the dark, and alfalfa seedlings grown in the light are effective in promoting growth and preventing xerophthalmia in rats when fed at the rate of 0.1 gm. per rat per day. The presence of vitamin A in the etiolated seedlings is in accord with results reported by Coward (E S. R., 57, p. 294). Dissections of rats on vitamin A-deficient diets showed abnormalities such as gastric ulcers, degeneration of the mesentery, and pus in the foramen cecum and inner ear.

The content of liver in vitamin A (especially in man) [trans. title], E. Laqueur, L. K. Wolff, and E. Dingemanse (*Deut. Med. Wchnschr., 54 (1928), No. 36, pp. 1495–1497*).—This is essentially a repetition of the work of Wilson (E. S. R., 58, p. 390), with the exception that the liver extracts were prepared by mixing the liver with water-free sodium sulfate and extracting with chloroform instead of with ether. The antimony trichloride test was used, with the Lovibond colorimeter for color comparisons.

Various cod-liver oils were found to differ quite widely in their vitamin A content as thus determined. Hog liver contained less vitamin A than beef liver, and the content of the latter was found to vary with the season of the year. Samples of human liver were also found to vary widely in their vitamin A content.

A detailed study of the role of vitamin B in anorexia in the albino rat, B. Sure (*Jour. Nutrition, 1 (1928), No. 1, pp. 49–56, fig. 1*).—Data are reported and discussed on the value of various yeast concentrates in stimulating appetite and promoting prompt gains in weight in female rats subjected to vitamin B deficiency during lactation (E. S. R., 59, p. 491), and continued on the deficient diet until marked symptoms of anorexia appeared. The response to the various preparations was rapid, and most marked with the most highly concentrated preparations. The author is of the opinion that "the organic and functional anorexias so frequently encountered in the human may largely be attributable to cumulative effects of vitamin B deficiency."

Symptomatology of vitamin B deficiency in infants, B. R. Hoobler (*Jour. Amer. Med. Assoc., 91 (1928), No. 5, pp. 307–310*).—Personal observations of infantile beriberi in the Philippines and of similar symptoms in undernourished babies under observation at the Children's Hospital of Michigan are reported and discussed. The similarity in the symptoms and the prompt relief on administration of vitamin B concentrates are thought to indicate that the babies were suffering from partial deficiency of vitamin B, a deficiency considered to be quite common among both breast-fed and artificially-fed babies receiving no special vitamin B supplements. The chief symptoms are given as anorexia, loss of weight, spasticity of the arms and legs, rigidity of the neck, and restlessness and fretfulness. It is the author's belief that "every infant should have an addition of vitamin B to its formula and should not depend on milk, either human or cow's, as its only source of this vitamin. Just as regularly as orange juice and cod-liver oil are prescribed, one should also prescribe a substance rich in vitamin B for the infant dietary."

The effect of inadequate vitamin B upon sexual physiology in the male, H. M. Evans (*Jour. Nutrition, 1* (*1928*), *No. 1, pp. 1–21, figs. 13*).—The claim made by some investigators that withdrawal of vitamin B (chiefly the antineuritic vitamin) from the diet of male rats is followed by degenerative changes in the testes is thought to be disproved by two types of experiments which are reported in detail in this paper. In the first the animals were fed from weaning inadequate sources of the vitamin (limited amounts of yeast) in a diet furnishing all other components in supposedly adequate amounts, including sufficient wheat germ oil to supply an abundance of vitamin E, and were mated at the appropriate time with females of known fertility. In the second type of experiment mature male rats reared from weaning on complete synthetic diets or adequate natural food were deprived of all sources of vitamin B and were then mated with fertile females.

The first series of experiments had the advantage of extending over a much longer period than was possible in the second, but both gave concordant results in showing that both acute and chronic deficiency of the antineuritic vitamin causes no actual injury to the testes. The sole injury to the productive function appeared to be a decrease in sex interest, but even this effect was not shown in some instances until shortly before death. Changes noted by other observers are attributed to inadequate vitamin E in the experimental diets.

Mode of action of vitamin D.—Question of regulation of gut acidity, L. J. Harris (*Sci. Prog.* [*London*], *23* (*1928*), *No. 89, pp. 68–74*).—A review and discussion of recent literature on the mode of action of vitamin D. In the author's opinion "there is considerable evidence for the idea that the primary defect in rickets which is corrected under ultra-violet treatment and by the other curative agents may be the absorption of phosphate (or calcium, or both) from the gut, with the H-ion concentration as a limiting factor."

The distribution of vitamin E, N. Simmonds, J. E. Becker, and E. V. McCollum (*Jour. Nutrition, 1* (*1928*), *No. 1, pp. 39–47*).—In this paper the authors withdraw their former opinion that vitamin E has a rôle in iron assimilation (E. S. R., 57, p. 296) and that wheat germ oil protects animals against the injurious effects of feeding ferrous sulfate because of its content of vitamin E, this now being attributed to the accelerated destruction of vitamin A by ferrous sulfate.

Evidence is presented that certain samples of lard and of cod-liver oil contain vitamin E in appreciable amounts. This fact and the considerable variation in the degree to which individual male rats withstand the effect of diets low in vitamin E are thought to complicate the study of the distribution of vitamin E.

Relation of vitamin E to growth and vigor, H. M. Evans (*Jour. Nutrition, 1* (*1928*), *No. 1, pp. 23–28, figs. 5*).—Data are reported showing that vitamin E has a favorable effect upon the final stage of growth (growth after sexual maturity) in both male and female rats. During the first 90 days of life significant differences may not occur in the growth of the rat on diets rich in or free from vitamin E, but the improvement is evident after the eighth month and marked after one year. The wheat germ oil used as a source of E has been shown to be too low in vitamins A and D to have a favorable effect through their presence, and as it was administered apart from the cod-liver oil there could have been no protective action toward vitamin A. Removal of the testes in no way changed the favorable effect on growth.

"It is apparent, therefore, that vitamin E does not exert its favorable effects upon growth and the general state of the animal indirectly through its established value to the sex glands, but in some other, possibly more direct way. The diminution in sex activity of males held upon E free régimes—a diminution shown only in the later stages of their lives—may not be due, it must be emphasized, to impairment of the testis, but may result from the constitutional inferiority of such animals—the special topic of the present paper."

Avitaminoses and related pathological conditions, edited by W. Stepp and P. György (*Avitaminosen und Verwandte Krankheitszustände. Berlin: Julius Springer, 1927, pp. XII+817, figs. 194*).—This volume of the series of Enzyklopaedie der Klinischen Medizin edited by L. Langstein, C. von Noorden, C. Pirquet, and A. Schittenhelm contains the following sections: The Experimental Foundations of Vitamin Knowledge, by W. Stepp; The Pathological Anatomy of Experimental Avitaminoses, by B. Kihn; Xerophthalmia and Keratomalacia, Rickets, The Tetany of Children, Osteomalacia and the Idiopathic Tetany of Adults, Scurvy in Infants and Children, Alimentary Anemia in Infants and Young Children, and The Relation of the Vitamins to Growth and Resistance, all by P. György; Scurvy of Adults, by V. Salle; Beriberi, by J. Shimazono; Ship Beriberi, by B. Nocht; Pellagra, by C. H. Lavinder; Edema, by A. Schittenhelm; and Sprue, by W. Fischer.

Studies on experimental rickets.—I, On the antirachitic property of crude "biosterin," the cholesterin-free, unsaponifiable fraction of cod liver oil, S. Izume and I. Komatsubaba (*Jour. Biochem., 9 (1928), No. 1, pp. 233–241, pl. 1*).—Crude "biosterin," a vitamin A concentrate prepared by a slight modification of the method of Takahashi and Kawakami (E. S. R., 50, p. 801), was found to be of high antirachitic potency, doses as small as 0.05 mg. per rat per day proving effective in curative tests on rats rendered rachitic by either the Steenbock or the Sherman-Pappenheimer diet. A technical "biosterin" preparation identified by the trade name Riken vitamin A was also found to contain a considerable amount of vitamin D.

Constitution of a new artificial diet for the study of experimental rickets [trans. title], L. Randoin and R. Lecoq (*Compt. Rend. Soc. Biol. [Paris], 97 (1927), No. 30, pp. 1277–1279*).—The authors have adopted as their basal rachitic diet for rats the following: Meat peptone 17, dried pulverized brewery yeast 3, butterfat 5, olive oil 5, sucrose 65, salt mixture 4, and calcium lactate 1 part. The salt mixture is the same as that of the Sherman-Pappenheimer diet 84.

Biological examination of the antirachitic value of lipids as determined on the young rat by means of a simple new rachitic diet composed of definite substances [trans. title], L. Randoin and R. Lecoq (*Ann Falsif., 21 (1928), No. 230, pp. 68–74, pl. 1, fig. 1*).—This is a more complete description than the one noted above of the authors' technique in preparing the basal rachitic diet and in determining the degree of rickets in experimental rats.

The salt mixture is prepared by grinding in a mortar the potassium alum, sodium fluoride, manganese sulfate, and potassium iodide and diluting the mixture with a small quantity of the calcium lactate. The ferric citrate is treated in the same way, and the other substances are ground in the mortar and the three mixtures combined. The various constituents of the diet are combined by mixing successively in the mortar the calcium lactate, salt mixture, pulverized yeast, sucrose, and meat peptone, and then adding the butterfat (previously decanted and filtered three times at from 30 to 35° C.), and the olive oil. The mixture, which must be perfectly homogeneous, is stored in a tightly closed tin box and can be used safely for about 15 days.

The rats are kept separately, or two or three in the same cage, in a dark room and are given the basal diet in amounts of 15 gm. per rat per day. Water and filter paper are furnished ad libitum. On this diet it is stated that in rats weighing from 30 to 45 gm. severe rickets is produced in from 18 to 20 days and in rats weighing from 60 to 70 gm. in from 30 to 40 days. The oils to be tested for antirachitic properties are introduced in place of an equivalent amount of olive oil. Special emphasis is given to the necessity of satisfactory growth in rats on the rachitic diet.

The comparative antirachitic value of some marine animal oils and of cod-liver oil [trans. title], L. Randoin, E. André, and R. Lecoq (*Jour. Pharm. et Chim., 8. ser., 7 (1928), No 11, pp. 529–539*).—Analytical constants and vitamin D values as determined by the method of Randoin and Lecoq (see above) and also that of Pappenheimer, McCann, and Zucker (E. S. R., 48, p. 363) are reported for three types of marine animal oils, (1) the liver oil of the merluce (hake), (2) the liver oil of the dogfish, and (3) the oil from the subcutaneous fat of the elephant seal. The first two oils showed weak antirachitic properties, estimated at about 10 and 5 per cent, respectively, of cod-liver oil. The seal oil was inactive. It was noted that the samples of the fish oils were obtained at the end of the summer and were probably of lower activity than in the spring.

TEXTILES AND CLOTHING

The Idaho wool caliper and its application in making density determinations, J. E. Nordby (*Idaho Sta. Circ. 52 (1928), pp. 8, figs. 5*).—The Idaho wool caliper, described with instructions for its operation, consists of two ½-in. calipers so assembled that an area ½ in. square may be laid off with considerable accuracy. The jaws are so shaped as to pass through average fleeces readily and through the denser fine wool fleeces with little difficulty.

An analysis of wide cotton sheetings, M. Furry and R. Edgar (*Jour. Home Econ., 20 (1928), No. 6, pp. 429–442*).—This report consists chiefly of the experimental data obtained in analyses of 130 brands of wide cotton sheetings, of which 12 were unbleached and 118 bleached, and of a few other fabrics for comparisons. The determinations included weight and thickness of the sheetings, thread count, percentage gloss, yarn count and diameter, yarn twist, yarn crimp, length and diameter of fiber, linear shrinkage of fabric, breaking strength, elasticity, and bursting strength of new, wet, and laundered fabrics, water extract, inorganic content, and detection of mercerization. References are included to the methods employed in all cases.

The fastness of dyed fabrics to laundering, R. G. Parker and D. N. Jackman (*Jour. Textile Inst., 19 (1928), No. 5, pp. T223–T232*).—The essentials of proposed American and German tests for fastness to laundering are discussed, and processes for washing white and dyed articles are commented on briefly. Several suggestions are made for contemplated systems of testing.

Study of mercurochrome stains, C. C. Hubbard (*Natl. Rev., 5 (1928), No. 10, p. 18*).—Tests seemed to show that mercurochrome combines with the dressings and sizing on silks as well as with wool and to indicate the total insolubility of the stain on fabric under certain conditions. Observations suggested that sulfur fumes had something to do with the permanency of the stain.

MISCELLANEOUS

Thirty-eighth Annual Report [of Alabama Station, 1927], M. J. Funchess et al. (*Alabama Sta. Rpt. 1927, pp. 32, figs. 3*).—This contains the organization list and a report on the work and publications of the station for the fiscal year ended June 30, 1927. The experimental work not previously reported is for the most part abstracted elsewhere in this issue

[Annual Report of Florida Station, 1927], W. Newell et al. (*Florida Sta. Rpt. 1927, pp. 121+V, figs. 14*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1927, and departmental reports, the experimental features of which, not previously reported, are for the most part abstracted elsewhere in this issue. A record of the soil formations identified by D. S. Massom in a well drilled to a depth of 1,332 ft. at Everglades Substation and an analysis of the water in this well are included.

Eighth Annual Report [of Georgia Coastal Plain Station], 1927, S. H. Starr (*Georgia Coastal Plain Sta. Bul. 9 (1928), pp. 63, fig. 1*).—This contains the organization list and a report of the director on the work of the station. The experimental work reported is for the most part abstracted elsewhere in this issue.

Thirty-ninth Annual Report of the Kentucky Agricultural Experiment Station for the year 1926, Part II (*Kentucky Sta. Rpt. 1926, pt. 2, pp. [2]+699+[2], figs. 86*).—This contains reprints of Bulletins 264–276, all of which have been previously noted.

Report of the Northeast Experiment Station, Duluth, 1926 and 1927, M. J. Thompson (*Minnesota Sta., Duluth Substa. Rpt. 1926–1927, pp. 62, figs. 12*).—The experimental work reported is for the most part abstracted elsewhere in this issue. Meteorological data are included.

Fortieth Annual Report [of Tennessee Station], 1927, C. A. Mooers et al. (*Tennessee Sta. Rpt. 1927, pp. 43, figs. 5*).—This contains the organization list, an account of the work of the station, and a financial statement as to the Federal funds for the fiscal year ended June 30, 1927. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Information regarding recent publications (*Kansas Sta. Circ. 141 (1928), pp. 6*).—This circular briefly describes Bulletins 237–245 and Circulars 125–140, previously noted.

The Bimonthly Bulletin, Ohio Agricultural Experiment Station, [September–October, 1928] (*Ohio Sta. Bimo. Bul., 13 (1928), No. 5, pp. 161–192, figs. 10*).—In addition to several articles noted elsewhere in this issue, this number contains Relative Profitableness of Low and High Producing Cows, by F. L. Morison (pp. 169–171), a complete account of which has been previously noted (E. S. R., 60, p. 83).

NOTES

California University.—Under the provisions of the will of late Mrs. Jessie D. Carr Seale, recently presented for probate, the regents of the university are to receive $125,000 to establish and maintain a professorship in the College of Agriculture in memory of the testator's father, to be known as the Jesse D. Carr Agricultural Chair. The will further provides the sum of $40.000 to establish and maintain five annual Henry W. Seale scholarships for undergraduate students, two in agriculture and three in the academic departments of the university.

Connecticut State Station.—At his own request, Dr. T. B. Osborne has been relieved of active charge of the biochemical laboratory and given the title of consulting biochemist. In recognition of Dr. Osborne's many years of service and his notable contributions in the field of protein chemistry, the following resolution has been adopted by the board of control:

"In the retirement of Thomas Burr Osborne from active charge of the biochemical laboratory, the Connecticut Agricultural Experiment Station loses one of the ablest and most valued members of its staff.

"In the 42 years that he has served on the staff, he has won distinction for himself and the station, and he is to-day one of the acknowledged leaders in his chosen fields of study, the structure of proteins and the newer aspects of nutrition. His mind has always been raising questions which he was able to define with rare precision, and then with equal discernment he has devised means for their experimental investigation and solution.

"The members of the board, in testimony of their recognition of his valued services, of their respect for his abilities, and of their high personal esteem, enter on their records this minute of their hearty appreciation. The members of the board further rejoice that from time to time the station may still have the benefit of his personal suggestions and advice."

The Thomas Burr Osborne gold medal of the American Association of Cereal Chemists, established in 1926 in commemoration of the "notable services to cereal chemistry" of Dr. Osborne, was awarded for the first time at the recent annual convention of that association, with Dr. Osborne as the recipient.

H. J. Lutz, assistant forester, and George Zundel, assistant in botany, have resigned to accept appointments elsewhere, the former in the U. S. D. A. Forest Service and the latter in the Pennsylvania College. Recent appointments include Dr. George W. Pucher as assistant biochemist for work on the nitrogen of the tobacco plant and Herbert A. Lunt as research assistant in forest soils.

Wisconsin University and Station.—Frank Kleinheinz, associated with the animal husbandry work of the institution for 38 years and since 1918 assistant professor of animal husbandry, shepherd, and assistant animal husbandman, died October 17, 1928, at the age of 73 years. Prof. Kleinheinz was a native of Bavaria, coming to the United States in 1882. His work was largely with sheep, and he was unusually successful in developing an outstanding herd of prize winning animals. He was also the author of numerous articles and bulletins and a widely known textbook entitled Sheep Management, Breeds, and Judging.

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EXPERIMENT STATION RECORD

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RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A textbook of organic chemistry, J. S. Chamberlain (*Philadelphia: P. Blakiston's Son & Co., 1928, 2. ed., rev., pp. XXX+901, figs. 8*).—A list of study questions at the end of each chapter and a bibliography of laboratory preparations are the main features distinguishing this from the first edition. Some new material has been added in bringing the book up to date.

In its present form the book contains for part 1 chapters on hydrocarbons of the saturated series—paraffins; monosubstitution products of saturated hydrocarbons; oxidation products of alcohols; unsaturated hydrocarbons; monosubstitution products of unsaturated hydrocarbons; polyhalides, cyanides, and amines; polyhydroxy compounds—polyalcohols; mixed polysubstitution products; polyaldehydes, polyketones, and polycarboxy acids; carbohydrates; amino acids and proteins; and carbonic acid, urea, uric acid, purine bases, etc. Part 2 comprises chapters on carbocyclic and heterocyclic compounds.

An introduction to the chemistry of plant products.—Vol. I, On the nature and significance of the commoner organic compounds of plants, P. Haas and T. G. Hill (*London and New York: Longmans, Green & Co., 1928, 4. ed., vol. 1, pp. XVI+530, figs. 3*).—This fourth edition of a textbook originally (E. S. R., 45, p. 201) published "to provide students with an account of the chemistry and physiological significance of some of the more important substances occurring in the plant," is said to have been, in the main, rewritten. The contents of the present volume include the following: Fats, oils, and waxes; aldehydes and alcohols; the carbohydrates; glucosides; tannins; pigments; nitrogen bases; the colloidal state; proteins; enzymes; and hydrogen ion concentration.

Colloid chemistry, R. Zsigmondy (*Kolloidchemie. Leipzig: Otto Spamer, 5. ed., rev. and enl., 1925, pt. 1, pp. XII+246, pls. 7, figs. 38; 1927, pt. 2, pp. X+256, pl. 1, figs. 16*).—The notation (E. S. R., 28, p. 407) of a previous edition of this well-known textbook remains an adequate indication of its scope and general content. It has, however, been enlarged and thoroughly revised to bring it up to date with respect to advances made in the field of colloids.

Colloid chemistry, T. Svedberg (*New York: Chem. Catalog Co., 1928, 2. ed., rev. and enl., pp. 302, figs. 167*).—The previous edition of this work has been noted (E. S. R., 51, p. 407). The present edition is stated to have been thoroughly revised and considerably enlarged, an extension of the treatment of X-ray analysis of sols and gels and of the section on Donnan potentials being especially noted. The main part of the work for this new edition is attributed by the author to A. Tiselius.

The internal pH of the cell, P. Reiss (*Le pH Intérieur Cellulaire. Paris: Presses Univ. de France, [1926], pp. 135, figs. 18*).—This monograph discusses the theory and practice of the measurement of pH values within the cell, taking into consideration such complicating factors as Donnan equilibrium, oxidation-reduction potentials, gel structure, etc., errors inherent in the colorimetric and in the electrometric procedures as applied to measurements within the cell, and including also a condensed review of the work of the principal experimenters in this field from 1914 to 1925, inclusive.

Part 1 deals with the fundamental theory. Part 2, the measurement of internal cellular pH values, contains chapters under the headings of historical, conditions of the measurement of internal cell pH and the causes of error, and practical methods of measurement. Part 3, the internal cellular pH, comprises the following chapters: Conclusions on the cellular pH, the regulation of the internal pH, the variation of the internal pH, and the importance of pH in cellular biology.

A bibliography (pp. 126–132) and digest conclude the monograph.

The protamines and histones, A. Kossel, trans. by W. V. Thorpe (*London and New York: Longmans, Green & Co., 1928, pp. XI+107*).—The English edition of this monograph is practically contemporary with the posthumous German edition. According to a preface by W. Kossel, "investigations on protamines and histones have been undertaken chiefly from biological aspects. The author was first led to study the evolutionary changes which protein . . . undergoes in the differentiation of the tissues. The change was discovered to consist in the production of proteins which are distinguished by basic properties from the generally widely distributed typical proteins, which possess acidic character. The protamines and histones form this class of proteins."

The monograph contains in part 1, on the protamines, chapters on the meaning of the term "protamine;" the units of the protamines, under which are discussed (*a*) the separation and quantitative estimation of the bases and (*b*) the separation of the monoamino acids; on the preparation of protamines, the properties and composition of the protamines, and the decomposition and constitution of the protamines.

Part 2, the histones, takes up the characteristics of the histone group, the histone of the erythrocyte nucleus, the histone of the thymus gland of the calf, and histones from sperm; parts 3 and 4 discuss the chemical relation of the protamines and histones to other basic proteins, and the biological significance of protamines and histones; and an appendix is concerned with the physiological action of the protamines and histones on the mammalian organism. The book contains also a considerable bibliography.

Studies on glutelins.—IV, The glutelins of corn (Zea mays), D. B. Jones and F. A. Csonka (*Jour. Biol. Chem., 78 (1928), No. 2, pp. 289–292*).—The fourth contribution of this series (E. S. R., 58, p. 410) again deals with two glutelins, extracted together by means of 60 per cent alcohol containing 0.2 per cent sodium hydroxide from the ground seed of yellow corn (*Z. mays*) and subsequently separted in 0.2 per cent aqueous sodium hydroxide solution by fractional precipitation with ammonium sulfate.

On adding a saturated ammonium sulfate solution to the 0.2 per cent sodium hydroxide solution of the mixed glutelins "until 3 per cent of saturation was reached" the first of the two glutelin fractions, designated the α-glutelin, was precipitated. It is stated, however, that "a quicker and sharper separation of the protein results when a slight excess of ammonium sulfate is added (4 to

5 per cent of saturation)." The purification of this product consisted in successive, thorough washings with a 5 per cent ammonium sulfate solution, with water acidified to pH 6.8, and with 70 per cent alcohol. Drying was accomplished with the aid of absolute alcohol and ether in the usual way, the yield on the basis of the meal used having been about 0.7 per cent

A second, or β-glutelin, was obtained from the supernatant solution from which the α-glutelin had been precipitated by increasing the proportion of added saturated ammonium sulfate solution to 16 per cent. The quantity of this glutelin was too small for analysis.

By the Van Slyke method (E. S. R., 26, p. 22) the basic amino acid content of the α-glutelin was found to consist of cystine 2.81, arginine 7.56, histidine 1.67, and lysine 6.71 per cent of the ash and moisture free protein. The α-glutelin showed on the same basis the elementary composition, carbon 54.07, hydrogen 6.94, sulfur 1.04, and nitrogen 16.10 per cent. The ash content of the preparation was 0.217 per cent. On the basis of its solubility in buffer solutions the isoelectric point of the α-glutelin was estimated by the method of Csonka, Murphy, and Jones (E. S. R., 55, p. 801) as occurring at pH 6.45.

On the separation of histidine and arginine.—IV, The preparation of histidine, H. B. Vickery and C. S. Leavenworth (*Jour. Biol. Chem., 78 (1928), No. 3, pp. 627–635*).—Having demonstrated in a previous study the complete precipitation of histidine from protein hydrolysis products by excess of the silver ion at pH 7.0 (E. S. R., 58, p. 12), the authors of this contribution from the Connecticut State Experiment Station have developed a method for the preparation of the amino acid in question from coagulated crude blood corpuscles, the raw material having been secured in the yield of 2,800 gm. of the dry powder from 22 liters of cattle blood, by diluting the fresh blood with an equal volume of 1 per cent sodium fluoride, centrifuging, treating the precipitate with a volume of 0.9 per cent sodium chloride equal to that of the serum removed, and again centrifuging and finally coagulating the blood cell mass in a large volume of boiling distilled water, with subsequent washings of water and of alcohol, after which the product was dried.

For the hydrolysis, 8 N sulfuric acid is preferred to 6 N hydrochloric acid on account of the danger of losing histidine in the removal of the chlorine as silver chloride.

The further steps in the preparation of histidine from dry coagulated blood cells consist in the precipitation of the histidine with silver at pH 7.4 ("the precipitation at pH 7.4 instead of at pH 7.0, which we have previously recommended, is necessary when one is dealing with a protein rich in histidine since, otherwise, a little histidine escapes precipitation"); reprecipitation of the histidine with Hopkins's mercuric sulfate reagent, and lastly, the direct crystallization of the crude histidine as free base at its isoelectric point, here given as pH 7.2. "A yield of from 4 to 5 per cent of the dry blood cells is readily secured."

The action of acetic anhydride and pyridine on amino acids, P. A. Levene and R. E. Steiger (*Jour. Biol. Chem., 79 (1928), No. 1, pp. 95–103*).—By heating 0.1 mol of certain amino acids with 100 gm. each of acetic anhydride and pyridine at 90° C. until no further evolution of carbon dioxide took place, the authors of this contribution from The Rockefeller Institute for Medical Research were able to obtain in each case derivatives of acetylaminoacetone. Phenylglycine, for example, yielded 1-phenyl-1-acetylaminoacetone, phenylalanine, 1-benzyl-1-acetylaminoacetone, and tyrosine, 1-(acetylparahydroxybenzyl)-1-acetylaminoacetone. With phenylmethylglycine, however, only acetylation took place, with no loss of carbon dioxide, an effect considered strong evidence of the necessity for the reaction in question of a mobile hydrogen atom attached to the 2-carbon atom of the amino acid concerned.

The reaction is tentatively explained as taking place in the steps (1) formation of a complex of unknown composition, resulting in enolization, which permits (2) the entry of an acetyl group attached through an oxygen atom to the 1-carbon atom, (3) migration of the acetyl group from carbon 1 to carbon 2, and (4) elimination of 1 molecule of carbon dioxide with the formation of the corresponding acetylaminoacetone.

Analysis, evidence of constitution, and physical constants are given for the compounds prepared.

Chaulmoogryl derivatives of lactates and salicylates, S. Santiago and A. P. West (*Philippine Jour. Sci., 35 (1928), No. 4, pp. 405–409*).—Chaulmoogric acid was prepared from the oil by saponification, decomposition of the soap, and recrystallization, following which the derivatives were made, after conversion of the acid into chaulmoogric acid chloride with phosphorus trichloride, by acting upon the corresponding esters with the crude chaulmoogric chloride at temperatures varying with the nature of the ester in an oil bath until hydrogen chloride gas was no longer evolved. The mixture is protected from entrance of moisture during the reaction (several days) by means of a calcium chloride tube in the end of the reflux condenser, and the chaulmoogric chloride esterifies the alcoholic and phenolic hydroxyls, respectively, of the lactic and salicylic acids.

The chaulmoogryl derivatives of methyl and ethyl lactates and ethyl and n-butyl salicylates were prepared in a state of purity considered sufficient for analysis. The corresponding derivatives of methyl, phenyl, amyl, and isoamyl salicylates were obtained in a less pure condition, such that their percentages of hydrogen and carbon were found about 3 per cent below the theoretical composition. It is considered that these double esters, which were made for the purpose of testing their therapeutic value, can be prepared rather easily, but they were found to have a tendency to decompose in hot weather if not kept in a cool place.

Phosphorus distribution in grains, J. E. Webster (*Jour. Agr. Research [U. S.], 37 (1928), No. 2, pp. 123–125*).—In this brief note from the Oklahoma Experiment Station, account is concisely given of determinations of the total phytin, lipoid, inorganic, and other phosphorus contained in wheat, barley, common kafir, yellow corn, oats, white corn, darso, and rye, as well as in the mung and soy beans and the cowpea.

"Only one salient fact stands out. There seems to be no relation between the total phosphorus content of the seeds and that of any of the fractions, nor is there any comparable variation found among the different fractions." Phytin phosphorus was found to be, in nearly every case, the most important fraction. In only two instances does it constitute less than 50 per cent of the total and in darso it represents 87 per cent. The inorganic phosphorus represents only a very small percentage of the total, as does also the phospholipin fraction in most instances."

The chemistry of water and sewage treatment, A. M. Buswell (*New York: Chem. Catalog Co., 1928, pp. 362, figs. 58*).—In this monograph the author makes note of the omission of analytical methods, considered to have been adequately covered by other workers, of the reduction of the treatment of the engineering aspects of the subject to the minimum of illustration and description necessary to an understanding of the chemical operations considered, and of an effort "to cover the literature as thoroughly as possible down to the date of publication."

The first section, water and water treatment, contains two introductory chapters, notes on chemical theory, and colloids, the first of these dealing rapidly but somewhat fundamentally with the electron theory of atomic structure and chemical action, the law of mass action, ionization, electrical conductivity of solutions, hydrogen-ion concentration and the pH scale, etc., while the second chapter similarly summarizes colloids and colloidal behavior. The remaining chapters of this section take up the composition, properties, and occurrence of water; chemical composition of natural waters; economic disadvantages of unsuitable waters; industrial water treatment—lime and soda process and zeolite process; special methods of water treatment; water for domestic use; the chemistry of coagulation; filtration and disinfection and odors and tastes in water.

Section 2, sewage and sewage treatment, comprises the following chapters: Chemical characteristics of sewage; methods of sewage disposal; the degradation of organic matter; the nitrogen cycle; sludge digestion; microbiology of sludge reduction; removal of colloids from sewage by filters; removal of colloids from sewage by activated sludge; and microbiology of colloid removal.

A new rapid method for the determination of manganese [trans. title], G. Spacu and J. Dick (*Ztschr. Analyt. Chem., 74 (1928), No. 5–6, pp. 188–191*).—From solutions of manganese salts excess of alkali thiocyanate and pyridine precipitated the manganese quantitatively as manganese dipyridine dithiocyanate, whether cold or hot solutions were used. From hot solutions colorless, shining, monoclinic prisms were precipitated. As a procedure for the determination, however, the authors propose the cold precipitation of a neutral solution containing manganese equivalent to from about 0.15 to about 0.6 gm. of manganese sulfate pentahydrate, diluted to from 50 to 100 cc. by treatment with 1.5 gm. of solid ammonium thiocyanate followed by 4 cc. of pyridine, added with vigorous stirring, after which the mixture is allowed 2 or 3 minutes to settle and is filtered off on a porcelain filter crucible.

A mixture of 80 cc. of pyridine, 20 gm. of ammonium thiocyanate, and 920 cc. of water is recommended for transferring the precipitate to the crucible, after which it is stated that the precipitate should be washed 4 or 5 times with a mixture consisting of 15 cc. of 95 per cent alcohol, 75 cc. of water, 0.5 gm. of ammonium thiocyanate, and 10 cc. of pyridine. A brief washing with 10 cc. of absolute alcohol with 1.5 cc. of pyridine is given to remove the water, and the strong alcohol wash solution is removed by washing 5 or 6 times with 15 cc. of ether mixed with 2 drops of pyridine. Crucible and precipitate are then dried to constant weight under reduced pressure, 15 minutes being considered sufficient for this operation, and weighed.

Manganese in the form of the sulfate and within range of the sample quantities above mentioned is shown in a table of 20 determinations to have been determined with very close approach to the theoretical constitution of the manganese salt used. It is noted that if the manganese solution be treated with very small quantities of the thiocyanate and pyridine reagent the manganese is not precipitated, a fact which makes possible a separation by this reaction of manganese from cobalt, nickel, and other metals which also form double thiocyanates with pyridine and which are precipitated at concentrations of the reagents low enough to leave the manganese quantitatively in solution.

Titrimetric determination of amino acids [trans. title], K. Linderstrøm-Lang (*Hoppe-Seyler's Ztschr. Physiol. Chem., 173 (1928), No. 1–2, pp. 32–50*).—Following a discussion of the mathematical theory of the titration of amphoteric electrolytes and of the behavior of indicators, a detailed account is given of the development and trial of a method for amino acid titration, the procedure consisting essentially in the titration with N/10 hydrochloric acid of 10 cc. of the aqueous amino acid solution taken up in 100 to 200 cc. of 99 per cent acetone. Naphthyl red (benzolazonaphthylamine), a method for the preparation of which is detailed, is used as indicator.

It is stated that none of the most effective buffer solutions upset the titration, and that by its means it is possible to determine in monoaminomonocarboxylic acids, diaminomonocarboxylic acids, monoaminodicarboxylic acids, and in the hydroxy acids of these types of compounds, 100 per cent of the total nitrogen; in asparagine, arginine, tryptophane, and dipeptides, 50 per cent of the total nitrogen; in histidine, 66.6 per cent; and in creatine and guanidine, 33.3 per cent. Urea gave an incomplete titration, and in taurine none of the nitrogen was determinable by this method.

The data obtained in the titration of substances of all of the above-mentioned types are given in substantiation of the claims made.

Testing milk and its products, E. H. FARRINGTON and F. W. WOLL (*Madison, Wis.: Mendota Book Co., 1928, 27. ed., rev. and enl., pp. VI+280, pl. 1, figs. [64]*).—Laboratory directions for testing dairy products, together with new information for making chemical analyses of importance in dairying, are given in this revised treatise (E. S. R., 52, p. 12).

The manufacture of starch, F. REHWALD (*Die Stärkefabrikation. Vienna and Leipzig: A. Hartleben, 1924. 5. ed., rev., pp. VII–324, figs. 93*).—This is a technological monograph on the manufacture of starch, dextrin, glucose, etc., a previous edition of which has been noted (E. S. R., 27, p. 15). A more recent English edition has also been noted (E. S. R., 56, p. 506).

METEOROLOGY

Practical applications of meteorology to agriculture [trans. title], J. SANSON (*Grande Rev. Agr., 1928, No. 5, pp. 519–532, figs. 9; abs. in Jour. Min. Agr. [Gt. Brit.], 35 (1928), No. 7, pp. 618–626*).—This article deals with the practical value to agriculture of weather forecasts and warnings and the correlation of climatic conditions, especially rainfall, with crop yields, and advocates and describes simple installations for weather observations and the receipt by radio of local forecasts on individual farms. The history of the development and improvement of forecasts is briefly reviewed, as are the applications of climatology in selecting crops adapted to a given set of conditions, in control measures for plant diseases, in frost protection, and in relation to the selection and use of fertilizers. Attention is called to the fertilizing value of rainfall and its relation to the physical, chemical, and bacteriological properties of soils as affecting plant growth.

The English summary is by W. R. Black.

Phenological observations in 1927 [trans. title], H. BOS ET AL. (*Landbouwk. Tijdschr. [Amsterdam], 40 (1928), Nos. 481, pp. 517–527, figs. 3; 482, pp. 582–591, pl. 1, fig. 1*).—A brief review is given of phenological observations in general during the year, with more detailed data for observations on plants, insects, and fungi in the Netherlands.

Some relations between meteorological factors and forest fires, J. V. HOFMANN (*Penn. Acad. Sci. Proc., 2 (1927–1928), pp. 31–34, figs. 2*).—Records of relative humidity and forest fires taken at fire towers of the Pennsylvania Forest Service show that "during periods of relative humidity above 50 per cent, fires do not flare up into uncontrollable conflagrations. When the humidity drops below 40 per cent the situation becomes dangerous, and when 30 or 20 per cent is reached an extreme fire hazard exists."

Correlation between rainfall and cacao yields in the Gold Coast, with special reference to effect of April rains on the following cacao crop, W. T. O. Maidment (*Gold Coast Dept. Agr. Bul. 13 (1928), pp. 83, 84, pls. 3*).—Graphs are given which show a distinct parallelism between monthly rainfall and the monthly cacao yields in three different localities on the Gold Coast. The relation between April rainfall and the following crop is especially evident, and it is suggested that this relationship may furnish a possible guide for forecasting the cacao crop in regions having conditions similar to those in which the observations were made.

A study of 39 years' rainfall, E. J. van Meerten (*Farming in So. Africa, 2 (1927), No. 16, pp. 177, 178, 182, fig. 1*).—Rainfall data at Middelburg, Union of South Africa, from 1888 to 1926, inclusive, are analyzed with reference to the recurrence of droughts and the possible existence of cycles which would furnish a basis for forecasting weather conditions. It is stated that there appears to be evidence of 7-year, 9-year, and 11-year cycles, and a forecast based on these is attempted.

A further study of the rainfall, E. J. van Meerten (*Farming in So. Africa, 3 (1928), No. 30, pp. 967–970, 973, figs. 5*).—This article supplements that noted above, with special reference to seasonal rainfall as distinguished from annual rainfall. It is shown that there has been a general decrease in rainfall since 1890 in the region of Middelburg, Union of South Africa, with alternations of good and bad seasons, and the author is led "to believe that there is a possibility of the existence of a large cycle of say 72 to 75 years." It is thought that in conformity with this cycle there will be during the next 30 years "a gradual increase in rainfall for this area, up to the maximum, when heavy rainfalls like those of 1890 will again be reached."

Meteorological summaries for the year 1927 (*Kentucky Sta. Rpt. 1927, pt. 1, pp. 42–44*).—Tabular summaries are given of records of the United States Weather Bureau Station at Lexington, Ky., on temperature, precipitation, wind, and cloudiness. The records for temperature and precipitation cover the period 1872–1927.

Meteorological records of the Gold Coast for 1927, compiled by N. P. Chamney and J. M. Adams (*Gold Coast Dept. Agr. Bul. 13 (1928), pp. 149–160, pls. 2*).—Observations on rainfall, humidity, and temperature at a number of stations in this region are reported and briefly discussed, and a rainfall map is given. Reference is also made to the beginning of a study of the relation of weather to crops, especially the relation between rainfall and cacao yields, noted above.

SOILS—FERTILIZERS

Elements of practical soil working, O. Heuser (*Grundzüge der Praktischen Bodenbearbeitung auf Bodenkundlicher Grundlage. Berlin: Paul Parey, 1928, pp. VIII+228, figs. 101*).—It is noted in the author's preface that views with respect to the most useful treatment for cultivated soils have been much altered in the last decade as a result of advances in biology, colloid chemistry, and soil science generally. The present volume is not intended as a comprehensive treatment of all means of soil working thus made available, however, but is limited to those considered of the most practical importance, and deals with the available scientific information on the same basis, emphasis being laid on those procedures having a direct influence upon the condition of the soil. The book is divided into five sections, (1) soil science fundamentals, (2) the components and properties of the soil, (3) the working of the soil, (4) protective measures, and (5) the finished state of the soil.

The influence of the soil reaction on the ionizable constituents of the tomato as determined by electrodialysis, E. S. HABER (*Jour. Agr. Research [U. S.], 37 (1928), No. 2, pp. 101–114, figs. 12*).—Tomato plants were grown in the greenhouse of the Iowa State College in three soils adjusted to reactions of pH 8.5 to 9.0, 6.5 to 7.0 (the original reaction of the soil), and 4.0 to 4.5. The fruit was gathered when just beginning to yellow at the blossom end. The roots, stems, leaves, and fruit, after their preparation in suitable suspensions, were electrodialyzed in the Clark, Humfeld, and Alben modification (E. S. R., 58, p. 514) of the Mattson cell (E. S. R., 56, p. 115). Anions and cations separable by electrodialysis from these suspensions were determined by titration of the contents of the respective compartments of the electrodialytic cell.

From the resulting data, here presented both in graphic and in tabular form, it was ascertained that "more acid materials as determined by electrodialysis were found in plants grown on acid soil and more basic materials in plants grown on alkaline soil. The percentage differences were in the order, root, stem, leaf, and fruit." The leaves contained the greatest amount of ionizable substances, according to the conclusions drawn from the results here recorded, the roots and fruit apparently containing the least.

The relation of soil type to the exchangeable calcium and magnesium in some Illinois soils, M. P. CATHERWOOD and E. E. DETURK (*Jour. Amer. Soc. Agron., 20 (1928), No. 7, pp. 657–678, figs. 3*).—Four soil types, a light-gray silt loam on tight clay, a brown-gray silt loam on tight clay, a brown silt loam, and a black clay loam, were studied in this investigation by the Illinois Experiment Station into the relation of exchangeable calcium and magnesium content to the soil type, the types considered being briefly characterized and the analytical procedures outlined.

The paper is divided into two sections, of which the first deals with the relation of the exchangeable calcium and magnesium to the apparent maturity of the soil, the total amounts of exchangeable and nonexchangeable calcium and magnesium, the ratio exchangeable calcium: exchangeable magnesium, and the percentage of the total calcium and magnesium present in the exchangeable state, all with reference to the surface soil. The second section deals similarly with the data and conclusions arrived at in the study of all the horizons of the types above considered with respect to surface soils. The considerable accumulation of data is represented by tables and in part in graphic form.

From section 1 of the investigation, the study of surface soils, it was concluded, in part, that with increasing maturity of the soil type there is a decrease in the contents of the exchangeable calcium and magnesium, the exchangeable contents in both bases showing consistent and significant differences among the four soils. The nonexchangeable calcium, however, is fairly constant through the four types, the nonexchangeable magnesium, while more variable than the corresponding calcium, also showing variations small in comparison with those of the exchangeable base. The percentage of the total calcium and of the total magnesium found in the exchangeable state varied considerably from type to type, "the more mature the soil type the smaller the proportion of the total bases present in an exchangeable form. . . .

"The mean ratios, $\frac{\text{M. E. Exchangeable Ca}}{\text{M. E. Exchangeable Mg}}$, in the types studied are all less than 3. The variations from type to type are significant from a statistical point of view, but are rather small as compared to the wide variations in the amounts of these bases present in the different types in an exchangeable form."

Section 2 of the investigation yielded, in part, the following conclusions: Except in the black clay loam, increasing depth was associated with increasing exchangeable calcium and magnesium. The exchangeable bases under consideration tended toward a uniform value in the C horizon, between 20 and 30 mg. equivalents in 100 gm. of soil.

"The relative difference in the exchangeable calcium and exchangeable magnesium content of the surface horizon compared with the B and C horizons is greatest in the most mature soil type and becomes less as soils of less maturity are considered. Black clay loam is higher in these bases in the surface than in the deeper horizons. The ratio of exchangeable calcium to exchangeable magnesium in any one horizon is fairly constant, even among soil types which exhibit very great variations in their content of these constituents. This ratio tends to become narrower with an increase in depth until the C horizon is reached. There is a tendency for the percentage of the total calcium and of the total magnesium present in an exchangeable form in the soils examined to increase in the B and C horizons as compared to the upper horizons, except in the case of black clay loam where the reverse is true."

The effect of soil type and fertilization on the composition of the expressed sap of plants, M. M. McCool and M. D. Weldon (*Jour. Amer. Soc. Agron., 20 (1928), No. 8, pp. 778–792, fig. 1*).—The study by the soils department of the Michigan Experiment Station of the juices of leaves and stems of greenhouse-grown barley, sugar beets, field beans, and red clover and of field-grown celery, cabbage, sugar beets, wheat, and rye, with reference to the relation of soil solution and plant juice concentrations to the mineral nutrients led to the observations that (1) the field-grown plants contained generally more of these nutrients than did the greenhouse plants; (2) the leaves usually contained greater percentages of each of the nutrients than did the stems, but it seemed that in rainy weather more potassium may be leached from the leaves than from the stems; (3) applications of mineral fertilizers to the soil resulted generally in increased concentrations of the corresponding elements in the juices of the crop plant; and (4) where one element was a decided limiting factor the slow growth of the plant appeared to permit the accumulation of high concentrations of the other nutrient elements. "Under these conditions applications of the limiting element to the soil as fertilizer are likely to decrease the concentrations of the other elements in the plant."

Soil survey of Cherokee County, Alabama, J. F. Stroud et al. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1924, pp. III+25–62, fig. 1, map 1*).—Cherokee County contains 382,720 acres of a surface varying from almost level to gently rolling sections in limestone valleys to hills, ridges, and high mountains, for the most part well to excessively drained, in the northeastern part of Alabama.

Of the 26 types and 17 series mapped and described by this report, prepared in cooperation with the Alabama Department of Agriculture and Industries, the largest areas are in Holston fine sandy loam 10.1 per cent and Colbert silt loam 12.3 per cent of the area studied. Unclassified areas of rough stony land 4.4 per cent and mine wash 0.1 per cent are recorded.

Whiteside County soils, R. S. Smith, O. I. Ellis, E. E. DeTurk, F. C. Bauer, and L. H. Smith (*Illinois Sta. Soil Rpt. 40 (1928), pp. [2]+65, pls. 2, figs. 9*).—Whiteside County comprises an area in northwest Illinois of 448,570 acres varying in topography from flat to rough and broken lands, draining, for the most part, through Rock River into the Mississippi. The soils of this tract are mapped and described in the five main groups of upland prairie soils (18.48 per cent of the entire county); upland timber soils (18.32 per cent); terrace soils (38.82 per cent); and swamp and bottom-land soils (23.05 per cent). Water surface amounting to 1.31 per cent completes the summation.

The more extensive types listed are an upland prairie brown silt loam 13.31 per cent, a terrace brown sandy loam 12.35, and a terrace brown silt loam over gravel 10.55 per cent. Dune sand, 4.75 per cent, and rock outcrop, 0.02 per cent, were also found.

In addition to the soil survey proper, the report contains an appendix comprising explanations for the interpretation of the soil survey and an article on the principles of soil fertility, together with a supplement presenting experiment field data.

Soil survey of Iowa.—Reports 50–53, W. H. STEVENSON, P. E. BROWN, ET AL. (*Iowa Sta. Soil Survey Rpts. 50 (1927), pp. 64, pl. 1, figs. 10; 51 (1928), pp. 56, pl. 1, figs. 10; 52, pp. 80, pls. 2, figs. 20; 53, pp. 62, pl. 1, figs. 9*).—These four reports map and describe, in the four groups of drift, loess, terrace, and swamp and bottom-land soils, the series and types recorded, respectively, in Jefferson County 275,840 acres in southeastern Iowa, Clarke County 273,920 acres in the south-central part of the State, Winneshiek County 439,040 acres in the northeast corner, and Appanoose County 328,320 acres in the southeastern section. In the two last-named counties a fifth group, of residual soils, was also recognized. In topography and drainage the four counties are characterized as follows:

Jefferson County is considered to have been originally a broad, nearly level plain, but streams have now cut it extensively, leaving level uplands, eroded and hilly uplands, terraces or second bottom lands along various streams, and bottom lands. Drainage is supplied in this county mainly by the Skunk River and is in general fairly well developed.

Clarke County consists of irregular belts of rolling to strongly rolling hilly lands along the streams, narrow strips of level bottom lands bordering the streams, and more or less level areas between the streams. Tributaries of the Des Moines and Missouri Rivers provide an extensive drainage system.

Winneshiek County comprises in its western third a glacial drift area, constituting for the most part a gently undulating upland plain containing extensive flat sections having poor drainage conditions, and in the eastern two-thirds uplands covered by loessial material, gently rolling to rough sections, and narrow strips of bottom lands between the streams and the rock walls. Drainage, provided mainly by the Upper Iowa River, is generally satisfactory, but is poor in some portions of the drift uplands in the western part of the county.

Appanoose County consists of an originally level plain now considerably eroded along the streams, the northern half of the county containing level to rolling upland tracts while the southern half is of a more rugged surface. The natural drainage system of this county was found to be adequate.

In addition to the larger groups mentioned the soils of the four counties are subdivided into series and types, the Jefferson County survey showing 13 series and 20 types, of which Grundy silt loam 45.5 per cent and Clinton silt loam 32.8 per cent of the entire surface of the county, both loess soils, are preponderant in area. In Clarke County 8 series were recognized, each represented by but 1 type. Shelby loam, a drift soil, 42.2 per cent, and Grundy silt loam (loess) 41.6 per cent, are the types of important extent. A total of 21 series comprising 32 types was recorded in Winneshiek County, the soils of areal significance being Tama silt loam and Fayette silt loam (loess group) 30.9 and 25.6 per cent, respectively, of the acreage of the county, and Carrington loam (drift group) 12.1 per cent. Muck 0.1 per cent and rough stony lands 5.6 per cent are also included in the figures for this county. Appanoose County yielded 12 series inclusive of 15 types, the greater portion of the total soil area having been found to consist of Shelby loam 40.1 per cent and Grundy silt loam 25.8 per cent.

Supplementing the soil survey data recorded in these reports, each contains analyses and other data on the fertility requirements of the county dealt with, experiment field results, and other information of an agronomic character.

Soil survey of Ogemaw County, Michigan, J. O. VEATCH ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+903–928, pls. 2, fig. 1, map 1*).—Report is made in cooperation with the Michigan Experiment Station of the soil survey of a tract of 365,440 acres in the northeastern part of the southern peninsula of Michigan. The county surveyed lies in the glaciated area, and possesses topographic features characteristic of its origin, "moraines, till plains, outwash plains, glacial lake-bed plains, numerous lakes and swamps, flat plains, smooth slopes and billowy surfaces, knobs and ridges, potholes, and deep-set lake basins." An estimated 20 per cent of the land area is swampy or permanently wet, the remainder of the county being in part well to excessively drained.

The more extensive soil types recognized are classified as Grayling sand 12.3 per cent of the total area, Roselawn sand 13.4 per cent, and Nester loam 13.9 per cent, Rifle peat 9.9 per cent being next in area covered. Greenwood peat, to an extent of but 0.6 per cent, is also classified, as are also two muck soils, the Edwards and Lupton mucks, 0.2 and 3.2 per cent, respectively.

Soil survey of Green County, Wisconsin, J. J. GEIB ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. III+2001–2040, pls. 3, fig. 1, map 1*).—Green County, situated in extreme southern Wisconsin, includes an area of 374,400 acres topographically characterized as a dissected plain having its upland surface at a level of about 1,100 ft., the slight general slope being from northwest to southeast. The county lies within the drainage basin of the Rock River system.

The three types, Dubuque silt loam 31.1 per cent, Dodgeville silt loam 30.0 per cent, and Wabash silt loam 12.9 per cent, are the principal soils among the 13 series of 24 types noted in this report, prepared in cooperation with the Wisconsin Geological and Natural History Survey and the University of Wisconsin. Rough broken land 3.8 per cent and peat 1.4 per cent of the area surveyed are recorded unclassified.

The abo-abo soil of Occidental Negros, M. M. ALICANTE (*Philippine Jour. Sci., 35 (1928), No. 4, pp. 391–403, pl. 1, fig. 1*).—Abo-abo soil is here described as having been so called on account of its ashlike appearance, abo-abo being stated to be the Visayan term for ash. This soil, of which a physical, chemical, and biochemical study is here presented, occurs in several places in Occidental Negros, though it is said to constitute but a small portion of the total sugar lands of that district. "It occurs as small patches in the fields, from a fraction of a hectare to 100 hectares or more in extent; however, it is not unusual to find a hacienda of 300 hectares or more practically made up entirely of abo-abo soil. Abo-abo is a black, loose, porous soil. In the places examined where this type occurs three distinct layers are usuallly found, as follows: The surface soil, about 15 to 25 cm. deep, is black, very fine in texture and exhibits a porous property. The subsoil, about 25 to 35 cm. deep, is a fine light yellow sand, and the lower stratum consists of gravel and stones mixed with sand."

As an explanation of the infertility of this soil the following facts ascertained in the present investigation are offered: (1) Because of the peculiar physical character of the surface soil the evaporation and percolation rates are high, whereby the water supply available in the surface soil is greatly reduced. (2) During periods of low precipitation and high evaporation "the unusual formation of the strata—sandy subsoil and gravel substratum—. . . prevents the transmission of water by capillarity from below to the surface soil. Under this condition the crop suffers, not only from lack of moisture, but also from serious lack of plant food." (3) The porosity of the abo-abo soil is due principally to an insufficiency of colloidal materials, so that it lacks the retentive and absorptive power of soils of higher colloid content. (4) "The different soil organisms concerned in the formation of available plant foods are rendered inactive by the unfavorable reaction of the soil solution present in abo-abo soil." Biological activity was found below normal, and the organic matter, though its total quantity is regarded as rather high, was found to consist mostly of a resistant humus. (5) "The limited water supply in the surface soil and the unfavorable soil reaction are the factors responsible for rendering any commercial fertilizer application in abo-abo soil ineffective."

Recommendations for the improvement of this soil are in part as follows:

Seed during the wet season with legumes, especially mungo, cowpeas, or soy beans. Plow under as deeply as possible at flowering time, applying 1 to 2 tons of ground limestone per hectare. "Where mud press is plentiful the application of 2 to 3 tons of this per hectare will materially improve the physical property of abo-abo soil." Lime alone is considered useful, but not as effective as when applied in combination with green manures or nitrogenous organic matter.

Soils and crops (*Illinois Sta. Rpt. 1928, pp. 7-49, figs. 6*).—The work reported is largely in continuation of that previously noted (E. S. R., 58, p. 316). The results reported upon include the following:

Long-cropped land showed benefits from manure in permitting earlier working in spring. Topography was found to reflect subsoil character, with a definite and close relation between slope and character of soil. Illinois soils showed wide variations in productiveness and in response to systems of treatment, but organic matter was profitable on all fields and limestone on most, while phosphoric acid and potash were highly profitable on some fields. Balanced farming (rotation and soil treatment) multiplied corn yields 177 per cent. The superiority of livestock systems of farming over grain farming was greatly reduced by the introduction of supplementary soil treatment in both systems. Crop residues returned to the land increased the grain crop yield from 2 cts. to $7 an acre. Acre returns from manure were highest on dark soils. Fairly coarse limestone again proved of real value. The value of limestone was reflected in land income on both light and dark soils, and high calcium limestone seemed slightly more effective than dolomitic limestone. Soil acidity was found to be more serious in southern Illinois than farther north. Rock phosphate was found to be worth as much as $41 a ton on one field when used in grain farming, while potash added as much as $8 an acre with some crops. Superphosphate again showed a residual effect, but sulfur added little to crops after eight years. Legumes were again found to be useful in increasing crop yields.

Soil experiment fields (*Kentucky Sta. Rpt. 1927, pt. 1, pp. 13-15*).—Yields and treatments on seven experiment fields outside of the bluegrass region are given. On the Campbellsville field the results are considered to indicate the advisability of using rock phosphate by first applying sufficient lime to satisfy the lime requirement and then applying rock phosphate after such liming.

Experience with an intensive method for handling field experiments with fertilizers, G. W. Musgrave (*Jour. Amer. Soc. Agron., 20 (1928), No. 7, pp. 722-734, fig. 1*).—The method embodies the following essentials:

But two sets of variables are included in the experiment, one of which is superimposable upon the other (as methods of application of fertilizers and kinds of fertilizer materials). Plat treatments are systematically replicated and distributed throughout the experimental area in checker-board fashion and so arranged that comparisons may be made between pairs of plats by either variable (methods of application or fertilizers). Plats of $\frac{1}{40}$ acre each in size and containing a minimum of three rows each, with all data secured on the basis of individual rows, have proved very satisfactory. Sufficient check plats are included to give an index of the uncontrolled variation (gross) of the experiment. Particular attention is given to securing accuracy in the actual field operations.

The chemical and physical behavior of certain synthetic fertilizer salts when mixed with limestone and dolomite, W. H. MacIntire and K. B. Sanders (*Jour. Amer. Soc. Agron., 20 (1928), No. 7, pp. 764–770, fig. 1*).—Air-dry mixtures of limestone and dolomite with each of five concentrated synthetic ammonia compounds, ammonium sulfate, Leunasalpeter, potassium-ammonium sulfate, floranid, and Nitrophoska, were shown in these experiments at the Tennessee Experiment Station to have lost either no ammonia or only very small quantities after standing at room temperature for 36 days. With the moisture content adjusted to 6 per cent, the loss of ammonia was "nil in two cases and measurable in three. The maximum loss, however, was only one-seventh of the analytical error permitted the fertilizer analyst." Natural dolomitic limestone was less reactive than limestone.

The physical condition of each concentrate suffered in each case when the preparation was exposed to a circulating moist atmosphere. "In three cases the salts were practically liquefied." It was found possible to eliminate this tendency entirely, however, by mixing the concentrate with either of the two liming materials in the proportion of one part of the ammonia compound to four parts of the limestone. Two parts of Nitrophoska and one part of ground limestone remained granular and free from caking for some weeks in a greenhouse.

AGRICULTURAL BOTANY

Introduction to the biology of flowering plants, H. Meierhofer (*Einführung in die Biologie der Blütenpflanzen. Stuttgart: G. K. Lutz, 1926, 2. ed., rev., pp. XII+258, pls. 8, figs. 135*).—The preface to the first edition (not noted) of this book states that the work was conceived as supplementary to Sturm's Flora von Deutschland. This second edition has been revised and elaborated.

Anatomy and physiology of growth zone and annual ring formation in the Tropics, C. Coster (*Zur Anatomie und Physiologie der Zuwachszonen- und Jahresringbildung in den Tropen. Proefschr., Landbouwhoogeschool, Wageningen, 1927, pp. XI+225+3, pls. 6*).—In this doctor's thesis the author gives a detailed account of studies during the period 1922–1926 on 63 tropical and 22 temperate zone trees regarding facts and phases of vegetation and growth and the formative influences connected with the zones of growth and the formation of annual rings.

Surface energy and plant growth, F. Herčík (*Biol. Gen., 3 (1927), No. 1–2, pp. 83–94*).—The author, having observed that the surface tension of plant saps squeezed from seedlings of Vicia, Pisum, Lupinus, and Sinapis apparently depended on the conditions in which the plants had grown, that is, that the sap of etiolated plants studied had a smaller surface tension than had the sap of normal plants, considered the question whether there is really a relation or whether the relation observed was only accidental. The present paper is the result of an attempt to solve that question.

It is deduced from the evidence as presented that a relation exists between the relative area of a plant and the surface tension of its saps.

The plant cell contains many substances with different surface energies. Substances having the greatest surface activity will be adsorbed on the cellular surfaces and not only on the protoplasmatic layers but also on the surfaces of nuclei, vacuoles, etc. The cellular surfaces are subject to change. It is stated that light enhances (indirectly) the surface tension of plant sap. Light also diminishes the whole area of a plant. These phenomena are thought to be in some way connected. The activity of embryonal and stretching growth, and also of development, is indirectly proportional to the surface tension of the plant sap.

"It is, of course, not advisable to state that the dynamics of growth depends merely on the surface activity of the cellular surfaces, as there are certainly many other important factors, which participate in the plant growth. But the surface tension on the cellular surfaces seems to be one of the leading factors." Further questions are suggested.

Water requirement of cultivated plants under field conditions [trans. title], V. I. Il'in (W. I. Jljin) (*Zhur. Opytn. Agron. I͡Ugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *4* (*1927*), *No. 2, pp. 263–308; Ger. abs., pp. 304–308*).—Details, tabulations, and discussion are given as regards water utilization by winter rye and winter wheat, also as regards that by economic spring or summer growing plants, a considerable number of which were investigated in this respect.

The utilization of precipitation by growing plants [trans. title], N. Tulaĭkov (Tulaikow) and A. Kozhevnikov (Kosochewnikow) (*Zhur. Opytn. Agron. I͡Ugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *4* (*1927*), *No. 2, pp. 208–227, figs. 2; Ger. abs., pp. 226, 227*).—An account is given of water utilization during the stages of growth by wheat, rye, and sunflower as noted at the Saratov Experiment Station.

Ascent of crude sap in grafted plants [trans. title], C. T. Popesco (*Rev. Bret. Bot. Pure et Appl., 1927, No. 1, pp. 1–12, figs. 12*).—In the first few days following the operation of grafting, the crude sap (water and nutritive substances) passes from stock to graft by osmosis. Such passage is very limited, necessitating for the time some sort of a cover as a protection for the plant against too great a transpiration rate. Sap transfer of this sort goes on until connection is established between the vessels of the stock and those of the graft. After this occurs the movement of liquid and nutrient solutes goes on in mass by way of the newly formed vessels. The time required for this plan to become established varies even in individuals of the same species and at different hours of the day.

It is thought that this is the first case of utilization of the method described for studying sap ascent by means of grafts.

Cold resistance by plants.—I, Dynamics of soluble carbohydrates during winter in rye and wheat [trans. title], A. A. Rikhter (Richter) (*Zhur. Opytn. Agron. I͡Ugo-Vostoka* (*Jour. Expt. Landw. Südost. Eur.-Russlands*), *4* (*1927*), *No. 2, pp. 326–345, figs. 13; Ger. abs., p. 345*).—Cold resistance was determined for rye, two wheat varieties, and two rye-wheat hybrids, the materials being taken four times directly from the field in the winter of 1925–26.

The young rye plants were fully winter resistant. In the case of winter-resistant wheat, the portion above ground and the roots gradually died away, leaving alive only the more resistant portions to start new shoots in the spring.

The hybrids showed behavior intermediate between that of rye and that of wheat.

Development of conifers in raw humus [trans. title] (*Meddel. Statens Skogsförsöksanst.* [*Sweden*], *No. 23* (*1927*), *pt. 6–7, pp. 337–494, pls. 2, figs. 59; Ger. abs., pp. 412–432, 487–494*).—The first of these studies was begun in the spring of 1922, and the second in the fall of that year.

I. *The significance of nitrogen mobilization in the raw humus soil layer for the early development of pine and fir trees*, H. Hesselman (pp. 337–432).—Raw humus forms which with increase of light access quickly pass over into a nitrifying stage promote the production of fine strong plants having well-developed root systems provided with numerous and vigorous mycorrhizas. A detailed summary is given.

II. *The formation of mycorrhiza on pine plants in different forms of raw humus*, E. Melin (pp. 433–494).—In this section the author sets forth in detail the development of mycorrhizas and pseudomycorrhizas in pine seedlings during their first year.

Leaf plasticity and xeromorphic structure [trans. title], V. G. Aleksandrov (Alexandrov) and K. E. Tskhakaia (Zhakaia) (*Izv. Opytn. Sev. Kavkaza* (*Jour. Agr. Research North Caucasus*), *No. 9* (*1926*), *pp. 251–258, figs. 4*).—Leaf disks, 4 mm. in diameter, of *Helianthus annuus, Datura stramonium, Amaranthus retroflexus*, and *Ipomoea purpurea*, taken weekly from the first unfolding to the time of blooming, showed plasticity only in the case of *H. annuus*. In this plant the third leaf from the bottom is strongly mesomorphic. Up to the eighth leaf the structure is still mesomorphic, but beginning with that leaf xeromorphism prevails. The variations are supposed to be in relation with the movement of water and juices in the plant.

The chemistry of leaves lacking chlorophyll [trans. title], A. Grandsire (*Ann. Sci. Nat., Bot., 10. ser., 8* (*1926*), *No. 3–6, pp. 221–298*).—A detailed account, in five chapters with an extensive bibliography, is given of studies dealing with plants etiolated by being grown in darkness or by parasitic action, with leaves yellowed by autumn changes or by disease, and with albinism in plants.

Light distribution in coleoptiles of Avena and other phototropically stimulable plant organs under unilateral illumination, E. Nuernbergk (*Untersuchungen über die Lichtverteilung in Avena-Koleoptilen und Anderen Phototropisch Reizbaren Pflanzenorganen bei Einseitiger Beleuchtung. Jena: Gustav Fischer, 1927, pp. 162, pls. 12, figs. 5*).—In this paper (No. 12 of the series Botanische Abhandlungen, edited by K. Goebel) an account is given of the author's work, which bears largely upon phases and outcome of investigations by Blaauw (E. S. R., 42, p. 128). Theory and practice are descriptively and narratively set forth of a method for determining the distribution of light in unilateral illumination. The results are given in detail for the several plants used.

The action of chloroform on Allium cepa [trans. title], G. A. Nadson and N. Meisl (*Compt. Rend. Acad. Sci.* [*Paris*], *183* (*1926*), *No. 2, pp. 150–152*).—The authors, in continuance of the report noted previously (E. S. R., 59, p. 517), outline their study of chloroform action on protoplasm, nuclei, and chondriosomes in cells of *A. cepa*, stating that in the living onion subjected to chloroform the chondriosome is very sensitive. The protoplasm shows its response somewhat later and the nuclei very soon afterward.

The nitrogen metabolism of nitrogen-fixing bacteria, W. V. Hälversen (*Iowa State Col. Jour. Sci., 1* (*1927*), *No. 4, pp. 395–410*).—It is claimed to have been shown that a vigorous growth of legume bacteria and Azotobacter can be effected and enough combined nitrogen formed in a few days to permit the use of analytical chemical methods for detecting and partitioning the various forms.

From the data accumulated, the conclusion is thought to be justified that the first products of synthesis are the same for *Rhizobium leguminosarum* as for *A. chroococcum*. Soluble forms of nitrogen are formed by nitrogen-fixing bacteria during the early stages of growth when these bacteria are grown independently as regards higher plants or their enzymes.

New or critical Sphaeriaceae and Sphaerioidaceae [trans. title], N. A. Naumov (Naoumov) (*Mater. Mikol. i Fitopat.* (*Mater. Mycol. and Phytopath.*), *6 (1927), No. 1, pp. 1–12, figs. 10*).—The author describes the cultural characters, morphology, and habitat of 11 supposedly new forms of fungi, including *Anixia berkeley* n. sp. on Mucor, *Melanosporopsis subulata* n. g. and sp. on *Agaricus* sp., *Cucurbitaria sambucina* n. sp. on *Sambucus racemosa*, *Dichomera camarosporioides* n. sp. on *S. racemosa*, *Megalospora gemmicida* n. g. and sp. on *Picea pungens*, *Phoma borealis* n. sp. on *Vaccinium vitis-idaea*, *P. gypsophilina* n. sp. on *Gypsophila muralis*, *Ascochyta sodalis* n. sp. on *Plantago major*, *Rhabdospora carlinae* n. sp. on *Carlina vulgaris*, *R. erythraeae* n. sp. on *Erythraea centaurium*, and *R. plantaginis* n. sp. on *P. media*. *Melanosporopsis subulata* was thought to have six subspecies. Drawings show the various stages in the life history of the fungi.

Plant intumescences [trans. title], E. J. Ringuelet (*Rev. Facult. Agron. La Plata, 3. ser., 17 (1927), No. 2, pp. 237–254, figs. 15*).—Descriptive accounts are given of intumescences in *Eucalyptus globulus*, *Hedera helix*, and *Pelargonium peltatum*.

GENETICS

The inheritance of rachilla length and its relation to other characters in a cross between Avena sativa and Avena sativa orientalis, T. E. Odland (*West Virginia Sta. Bul. 219 (1928), pp. 55, figs. 3*).—The behavior of several characters was studied in several filial generations from Early Gothland (*A. sativa*) × Garton 784 (*A. sativa orientalis*). Early Gothland had a pubescent rachilla about 2.7 mm. long on its lower grain, white grain, open panicle, and leaves with prominent ligules. Garton 784 had a very short, nearly smooth rachilla about 1.6 mm. long, black grain, and a side panicle, and was liguleless.

Rachilla length was found a very stable size character, affected little by environmental conditions. Its inheritance was explainable on the basis of multiple factors for length of rachilla, apparently not equal in value. Ligule of leaf depended on duplicate factors giving 15 liguled to 1 liguleless plant in F_2. A single factor difference was found in panicle type. The presence of the two factors for the liguleless condition in the homozygous state inhibited the factor for open panicle if present, resulting in a side panicle. No open panicled liguleless forms appeared. Black color of grain was dominant to white, and pubescence of rachilla to smooth, both cases being controlled by single factor differences.

While close linkage was found between at least one factor or group of factors for rachilla length and the factor for rachilla pubescence, and the interrelations of the two factors for ligule and the factor for panicle type were obvious, no evidence of linkage was noted between factors for ligule, panicle type, color, or pubescence.

Inheritance in Ricinus communis L., I, II, S. C. Harland (*Jour. Genetics, 10 (1920), No. 3, pp. 207–218; 12 (1922), No. 3, pp. 251–253*).—Genetic studies with castor bean indicated the presence of bloom partially dominant to its absence, the simple factor pair for this character being *Bb*. Spininess of capsule was similarly partially dominant to absence of spines, the factor pair being *Ss*. In regard to stem color in the cross green × mahogany, two independently inherited factors, *M* for mahogany and *G* for green, were involved. The linkage relations of these factors are discussed.

Further tests showed *M* and *B* to be linked, with 8.3 per cent of cross-overs, while *G* is inherited independently of *M* and *B*.

Genetic studies in Ricinus communis L., J. E. Peat (*Jour. Genetics, 19 (1928), No. 3, pp. 373–389, pl. 1, figs. 2*).—Inheritance studies with castor beans at the Imperial College of Tropical Agriculture, using selections of material studied by Harland in work noted above, are reported to have resulted in the identification of a number of factors in Ricinus which affect the color of the vegetative parts, the leaf bloom, the color and pattern of the seed coats, leaf laciniation, spines, and albinism.

Color in the vegetative parts was found to depend upon the presence or absence of the factors *M*, *G* (converting tinged to green and mahogany to rose), and *E* (green blush). The various types of leaf bloom appeared to depend upon the action of three separate factors, *B*, *C*, and *D*. Two factors, *P* for sepia color and *A* for intensification of color in sepia and nonsepia groups, seemed responsible for the color of the seed coat. The pattern was affected by *W*, a factor for fine dotting, and there was evidence suggesting that it may be further influenced by two other complementary factors, and also by *G*. Deeply laciniated plants lacked a factor *L* present in the normal. A simple Mendelian relation seemed also to exist between normal and albino. Partial dominance appeared to be the rule for the various characters studied. Aside from *M* and *B* showed by Harland to be linked, no other cases of linkage were observed.

Inheritance in Lolium perenne L., I, II, T. J. Jenkin (*Jour. Genetics, 19 (1928), No. 3, pp. 391–417*).—Two papers are presented.

I. *Seedling characters, lethal and yellow-tipped albino* (pp. 391–402).—A vigorous, full green *L. perenne* plant which gave rise on selfing to three distinct types of seedlings, surviving green, nonsurviving green, and chlorophyll deficient (yellow-tipped albino) was shown to be heterozygous for at least two pairs of factors represented by the symbols *L l* and *Y y*. *L l* is concerned with survival or nonsurvival of green seedlings and *Y y* with the appearance of chlorophyll deficient seedlings. There was no indication of linkage between *L* and *Y*.

II. *A second pair of lethal factors* (pp. 403–417).—Another normal plant which when selfed produced surviving and nonsurviving green seedlings in a 3:1 ratio seemed heterozygous for one factor pair L_1 l_1 distinct from *L l*. The behavior of these factors in selfed and hybrid progenies is discussed in some detail.

Nucleolar number and size in diploid, triploid, and aneuploid hyacinths, W. E. de Mol (*Cellule, 38 (1928), No. 1, pp. 5–65, pls. 3*).—A study of the chromosome constitution and behavior in numerous varieties of the garden hyacinth.

Regarding chimeras [trans. title], L. Daniel (*Rev. Bret. Bot. Pure et Appl., 1927, No. 1, pp. 19, 20*).—A brief bibliographic review is given of accounts and studies of plant chimeras.

Heredity looms larger in animal abnormalities (*Illinois Sta. Rpt. 1928, pp. 124, 125*).—In continuing the studies of hairlessness in animals (E. S. R., 58, p. 320), by E. Roberts, 900 haired and 293 hairless young have been now produced in matings of heterozygous individuals. Histological examinations of the thyroids and adrenal glands of such animals have shown no abnormalities.

Matings of hairless and haired swine produced normal F_1s, though the hair was coarser and the coat not so thick as in normal animals. Faulty hair was also found to be hereditary in three human families, and in one family it was found to be associated with defects of the teeth and sweat glands.

Dairy crossbreeding experiment nearing finish (*Illinois Sta. Rpt. 1928, pp. 177–179, figs. 2*).—Studies by W. W. Yapp of the inheritance of milk yield, percentage fat content, percentage of protein, and percentage of ash in the milk of the individuals produced by crossing Guernseys and Holsteins indicate that these characteristics are controlled by the combined influence of a number of separately segregating units. The percentage of lactose in the milk was so nearly the same in the two parental breeds that its segregation could not be demonstrated.

Spectrophotometer readings by W. W. Yapp and A. F. Kuhlman of the coloring matter in the milk of the Guernsey and Holstein breeds showed considerable breed differences. Though the critical points of both curves were at the wave length 540 and not materially different on the reflection scale, the neighboring points on wave length 510 and 570 produced entirely different curves. The curves for the F_1 and F_2 generations, while lower on the reflection scale than either breed, were essentially intermediate between the parents in trend, with a slight inclination toward the amount of pigment in the milk of the lower-pigmented parent. It appears that the color, like other characteristics of the milk, is influenced by a number of factors no one of which is dominant, though there is a suggestion that Holstein type of color may be dominant.

Crossbred pigs prove no better than purebreds (*Illinois Sta. Rpt. 1928, p. 124*).—In the continuation of this study (E. S. R., 56, p. 370) by W. E. Carroll and E. Roberts, there was no indication of significant differences in the rate or economy of gain made by crossbred and purebred pigs farrowed in the same litters.

Sex-linked characters of poultry, D. C. Warren (*Genetics, 13 (1928), No. 5, pp. 421–433, fig. 1*).—In studies at the Kansas Experiment Station the amount of crossing over found between the sex-linked factors rate of feathering and shank color was 47 per cent, rate of feathering and barring 48.6, gold and barring 45.6, and rate of feathering and gold 14.1 per cent.

From a consideration of these findings in connection with the work of others, the author has tentatively suggested the arrangement of the genes on the sex chromosome in the order, rate of feathering, silver, shank color, and barring, though recognizing the difficulty of accurately mapping until more closely related genes are found. Double crossovers were considered to occur rather frequently.

Parthenogenesis and the inheritance of color patterns in the grouse locust, Telmatettix aztecus Saussure, R. K. Nabours and B. Snyder (*Genetics, 13 (1928), No. 2, pp. 126–132*).—Genetics studies of this species of grouse locust at the Kansas Experiment Station indicated that there are four elementary dominant color patterns, mutations due to four factors located so closely on one pair of chromosomes that no crossing over occurred. Segregation of the factors occurred in parthenogentic reproduction as in bisexual reproduction. The haploid chromosome numbers in this species were 6 and 7 in the secondary spermatocyte division cells.

Transparency and mottling, a case of Mendelian inheritance in the goldfish, Carassius auratus, S. C. Chen (*Genetics, 13 (1928), No. 5, pp. 434–452, pl. 1*).—The case of a transparent scaled goldfish and the method of inheritance of this characteristic is described. A single pair of Mendelian factors is suggested to explain the situation. The homozygous dominant fish are transparent and the heterozygous individuals are of the so-called calico type, while the homozygous recessives are normal.

Mutable characters of Drosophila virilis.—I, Reddish-alpha body character, M. Demerec (*Genetics, 13 (1928), No. 5, pp. 359–388, figs. 2*).—Studies of the mutability and reversion in the locus for reddish-*α* an allelomorph of the sex-linked gene yellow in *D. virilis*, showed that all reversions to the wild type occurred only in heterozygous females. The frequency of reversions varied, but by selecting from lines showing a high degree of this tendency a family was established in which the frequency of reversions was kept at about 3 per cent, while another line was isolated in which reddish-*α* behaved as an almost constant character. There was some indication that the age of the female reduced the frequency of reversions, and in classes originating by reversions the amount of crossing over in the yellow-scute region was increased 24 times.

The new mutant characters on the spermathecae of the females of Drosophila melanogaster: Cell-degeneration and supernumerary spermathecae, H. Wexelsen (*Genetics, 13 (1928), No. 5, pp. 389–400, figs. 4*).—In this study from the University of California the occurrence of two mutations affecting the spermathecae of *D. melanogaster*, designated as degenerating, d_g, and supernumerary spermathecae, are described.

The results showed that both characters were recessive to the normal, d_g being located in the second chromosome about 1 unit to the right or left of curved wings (locus 75.5). The occurrence of three spermathecae was dependent upon the presence of recessive factors in the second and third chromosomes, and possibly in the fourth chromosome.

A further study of the so-called mutation of the bar locus of Drosophila, A. H. Sturtevant (*Genetics, 13 (1928), No. 5, pp. 401–409, fig. 1*).—Studies of bar-eye and its inheritance at Columbia University indicate that wild stocks carry no bar allelomorph, reverted bar or reverted infrabar being identical with the wild type.

Linkage of the factors for short-ear and density in the house mouse (Mus musculus), W. H. Gates (*Genetics, 13 (1928), No. 2, pp. 170–179*).—A more detailed account of the study previously noted (E. S. R., 58, p. 528).

A comparison of the chromosomes of the rat and mouse with reference to the question of chromosome homology in mammals, T. S. Painter (*Genetics, 13 (1928), No. 2, pp. 180–189, figs. 9*).—A comparative study of the chromosomes of the rat and mouse indicates that the diploid number in the rat is 42 and in the mouse 40. In the former there are two pairs of large chromosomes which stand out distinctly, while in the latter the chromosomes form a closely graded series when placed in serial alignment. It is, therefore, concluded that in the evolution of these two species there has been an extensive shifting of the chromosome material between nonhomologous chromosomes (thus serving as an explanation of the sterility in the crosses between them), and that homology between the chromosomes of the different eutherian species is not likely.

The development and morphology of the gonads of the mouse, II, III, F. W. R. Brambell (*Roy. Soc. [London], Proc., Ser. B, 102 (1927), No. B716, pp. 206–221, pls. 4, figs. 4; 103 (1928), No. B724, pp. 258–272, figs. 2*).—A continuation of this series (E. S. R., 57, p. 221).

II. *The development of the Wolffian body and ducts.*—The author describes the embryology and early development of the testes and ovaries of the mouse, pointing out that sex may be identified from the cross-sectional areas of the gonads of embryos 11.5 days after coitus and by microdissection at 12.5 days.

III. *The growth of the follicles.*—Adult ovaries were sectioned at different periods in the cycle for histological study of the development and growth of the oocyte and follicle. The smallest oocytes found in the adult ovary were approximately the same size as the average primordial germ cells found near the germinal ridge of a 10-day embryo, indicating that new oocytes are not formed in the adult ovary. They varied in size from 13 to 70 μ in diameter, and the size of the nucleus was directly related to the size of the oocytes, the growth rates of the two being similar. On the other hand, the growth rates of the follicle and the oocyte were directly related only up to the point of maximum growth of the oocyte, which occurred at the time the follicle was about 125 μ in diameter. After this period follicles developed to approximately 650 μ. The main growth of the follicle and formation of the theca interna and the antrum thus occurs after the oocyte has completed its growth. Very rapid growth in the follicle was observed chiefly by the enlargement of the liquor filled antrum during 2 days immediately prior to oestrum, presumably in response to oestrin. Ovulation occurred during prooestrum or early oestrum. The average number of follicles found to mature was 9.3. In 9 animals, follicles were observed in the process of degeneration at all times, and in 1 ovary showing the presence of 128 normal follicles over 100 μ in diameter there were 66 degenerating.

Studies in morphogenetics of animal pigmentation, III, IV [trans. title], N. A. Il'in (Iljin) (*Trudy Lab. Ėksper. Biol. Moskov. Zooparka* (*Trans. Lab. Expt. Biol. Zoopark, Moscow*), *2* (*1926*), *pp. 239–250, figs. 6; Ger. abs., p. 250; 3* (*1927*), *pp. 183–200, figs. 6; Eng. abs., pp. 199, 200*).—In part 3, the seasonal dimorphism of the color in the arctic fox, the author reports the seasonal changes in the coat color of this animal and attributes these changes to the influence of temperature (E. S. R., 56, p. 428).

In part 4, analysis of pigment formation by low temperature, it has been found that the blood supply of an organ determines its threshold of irritation. The threshold of irritation was lowered by obtaining an active hyperemia, resulting from an inflammation brought about by the action of absolute xylol, croton oil mixed with turpentine, or a mustard plaster, as well as after a unilateral section of the sympathetic cervical nerve. The interval between the action of the irritator and the moment when the pigments are formed in the growing hair is equal to 40 to 60 hours, while the capacity of the dorsal tissue to produce a reaction at low temperature was 70 to 75 hours after shaving, but 20 hours after cutting with a machine.

The pattern of the Himalayan rabbit appears to be under the control of external factors, such as temperature; internal factors, including hereditary constitution; and physiological factors such as the sympathetic nervous system and the heat regulatory mechanism.

The ability to form pigments in the nose tissue appears to linger for months and years after the action of the irritator, and the length of the pigmented portion of the hair is proportional to the duration of the action of low temperature. By examining the length of the pigmented portions of the hair during a specific time exposure at low temperatures, it was found that the hair on the back grows 83.3 μ per hour at −4° C., and 56 μ at −14°, while the hair on the nose grows at the rate of 24 μ per hour at + 31 to 33°, though individual hairs show considerable variation. The greater development of the coat in cold climates is dependent upon a longer period of growth rather than upon a greater rate of growth.

Observations on the ovary of the opossum (Didelphis virginiana).—I, Accessory ovaries of Beigel, and other outgrowths from the ovarian

surface. II, Some cases of defective corpora lutea correlated with pathological uteri and death of embryos. III, On the possible occurrence of an adrenal rest in an opossum ovary, C. G. Hartman (*Carnegie Inst. Wash. Pub. 380 (1927), pp. 285-300, pls. 6*).—The first paper reports the occurrence of accessory ovaries in at least 6 per cent of the opossum ovaries studied, these being in the form of pedunculated bodies consisting of normal ovarian tissue.

In the second paper the author describes several cases of embryos dying in the uteri which were found to be associated with degenerating corpora lutea in the ovaries. It is concluded that the congestion and hemorrhage of the corpora lutea was primary and the death of the embryos secondary, though in two cases in which the dams were in very poor health the two pathological conditions were probably the result of the same cause.

Ovarian and placental hormones, E. Allen and E. A. Doisy (*Physiol. Rev., 7 (1927), No. 4, pp. 600-650*).—After briefly reviewing the reproductive cycle of various stocks of animals, accounts are given of tests for the presence of the ovarian hormone in the tissues of different classes of animals, the chemical and physical properties of this hormone, and its effect on various physiological processes. The possibility of the production of several hormones by the ovaries and placenta is also pointed out, as well as the action of the single one which has been partially isolated on the various portions of the reproductive tract of ovariectomized animals.

Alcohol and body weight in the albino rat, F. B. Hanson, F. N. Sholes, and F. Heys (*Genetics, 13 (1928), No. 2, pp. 121-125, fig. 1*).—The growth rates of the treated and control rats for which birth weights and other data were noted (E. S. R., 58, p. 731) indicate that alcohol treatment retarded growth of both males and females, but that the retarding effect was not transmitted to the offspring even after ten successive generations of the treatment.

No preponderance of sex in sire's offspring (*Illinois Sta. Rpt. 1928, p. 175*).—A study by E. Roberts and W. W. Yapp of the sex ratio of 8,196 dairy and beef cattle showed that there were among the Holsteins 94.6 males per 100 females, among the Ayrshires 96.0, Guernseys 80.6, Jerseys 106.1, and Herefords 101.8. The results showed no evidence that a given sire produced a great preponderance of one sex in his offspring.

FIELD CROPS

The art and science of cultivation, A. D. Hall et al. (*[Rothamsted Expt. Sta., Harpenden], Rothamsted Conferences, No. 5 (1927), pp. 39*).—Papers presented at the Rothamsted conference held March 22, 1927, included Cultivation: The Art and the Science, by B. A. Keen (pp. 7-14); Cultivating the Chalk and Brick-Earth Soils of West Sussex, by H. Drewitt (pp. 14-17); On the Land in South-East Essex, by J. Steel (pp. 17-21); Cultivation Operations on the Yorkshire Wolds, by J. H. Spilman (pp. 21-25); and Spring Cultivations in the West, by J. Joyce (pp. 25-32); and a summary of the whole by C. Heigham (pp. 37-39).

Handbook of production of cultivated crops and commercial plants, J. Becker (*Handbuch des Hackfruchtbaues und Handelspflanzenbaues. Berlin: Paul Parey, 1928, pp. XIX+506, figs. 116*).—This volume treats in more or less detail of the history, nomenclature, distribution, and economic status, botanical characteristics and relationships, environmental and cultural needs, place in rotations, field and harvesting practices, improvement methods, seed production, insect pests and diseases, and in most cases the chemical composition of the sugar beet, fodder beet, kohlrabi, turnip, chicory, parsley, carrot, potato, and Jerusalem artichoke; oil seed plants including rape, false flax, mustard, and poppy; and flax, hemp, basket willow, black hollyhock, tobacco, and hops.

Technique in field trials, H. A. Mullett (*Jour. Dept. Agr. Victoria, 26 (1928), No. 2, pp. 65–71*).—Consideration of data from wheat variety trials in Victoria indicated that the replicated system of plats is essential to accuracy.

[Field crops investigations in Illinois] (*Illinois Sta. Rpt. 1928, pp. 59–69, 73–82, 83–87, figs. 6*).—Agronomic experiments (E. S. R., 58, p. 322) reported on included variety tests and breeding work with corn, wheat, oats, and barley (E. S. R., 58, p. 224), late planting of corn varieties on differently treated soil as a defense against corn borer, and measurements by G. H. Dungan of the effect of simulated hail injury on the development of the corn plant (E. S. R., 59, p. 132).

Corn from the 1927 crop of the high protein strain, grown by C. M. Woodworth and F. L. Winter, averaged 18.45 per cent of protein and the low protein strain 7.23 per cent. The high oil strain averaged 10.85 per cent of oil and the low strain 1.42 per cent. The ears in the high ear and low ear strains were 120.5 and 8.1 in. high, respectively, and in the 2-ear strain 80.1 per cent of the stalks bore two or more ears. The highest protein and the highest and lowest oil percentages in the history of the experiment were obtained in the 1927 crop. Variability did not seem to be always reduced by selection.

Little or no genetic relationship was evident between vegetative growth of corn and grain yield, these characters appearing due to different and independent factors. It appeared that an external agency, such as soil treatment, increases both vegetative growth and grain yield, causing a correlation between them. In a test of 345 selfed ears taken at random from 818 first-year selfed ears of Reid Yellow Dent 23 per cent of these ears yielded more marketable corn per plat than the parent variety, while the rest yielded less. F_1 hybrids averaged 90 per cent more yield than their (F_2) progeny, suggesting that hybrid seed will yield best if newly crossed seed is planted each year.

Corn chosen for seed when mature by Dungan, W. L. Burlison, and B. Koehler outyielded that picked at husking or in the dent stage or earlier, and field stands paralleled acre yields. Late varieties yielded best when planted early (May 5), while the medium early and early sorts did best when planted later (May 23) in tests by Dungan. Considering the quality of crop from the last (June 10) plantings, as measured by immaturity and moisture content of the grain, results strongly favored the use of earlier varieties when planting must be late. Again, E. E. DeTurk, E. G. Sieveking, and J. R. Holbert found that two disease-resistant inbred strains of corn, as well as a cross between them, yielded more with potassium treatment, while both a disease-susceptible inbred and a cross involving it failed to respond. Susceptible strains made relatively poorer growth where rock phosphate was the sole phosphorus source than where soluble phosphate was supplied. Marked differences were not found between the strains in phosphorus content of dry matter or of ash. Superiority of strains thriving where only rock phosphate supplied phosphorus seemed due to the more effective utilization of a limited quantity of phosphorus rather than to a superior foraging ability for phosphorus.

The hard wheats of the Turkey type continued to be both winter hardy and productive and therefore adapted to soil and seasonal conditions in central and northern Illinois. Michikoff and Minnesota Reliable consistently milled the strongest flour of any of the varieties grown at the station, and Minnesota Reliable also led in this respect at DeKalb. In general wheat grown on the DeKalb field was superior in baking strength to that grown at the station. Gladden, Michigan Amber, Illini Chief, and Fulhio have averaged the highest in yield at Alhambra. Judged by the same baking standard used for hard or bread wheats, varieties grown at Alhambra did not appear to be first-class bread wheats. The amounts of lodging in different wheat varieties on certain dates after maturity are recorded. Mass selection of the best heads was found quite effective in purifying a variety which had become badly mixed and apparently increased productiveness.

Northern-grown seed potatoes again yielded better and also rotted less than home-grown ones under all conditions of storage in studies by J. J. Pieper. Seed potatoes obtained from the north just before planting yielded 126.08 bu., while northern-grown tubers stored at the best temperature, 36° F., made 102.55 bu., and home-grown tubers stored under the same conditions only 62.99 bu.

[Field crops experiments in Kentucky, 1927] (*Kentucky Sta. Rpt. 1927, pt. 1, pp. 17–21*).—Self-fertilization studies showed the existence of red clover strains that are highly self-fertile and that this character is heritable. Certain strains of self-fertile plants appear to be immune from mildew. Red clover seed produced within or near Kentucky was superior to seed produced farther north, and Kentucky-grown seed and certain American strains outyielded foreign seed. The superiority of the better strains was strikingly evident in the stem growth in the first and second crops. Differences between alfalfa varieties in yield and persistence were not pronounced.

Application of as much inoculating soil as would adhere to moistened soy bean seed was again as effective in producing nodules as much larger quantities of soil applied in other ways. Deferring the planting of inoculated seed up to 6 days did not result in appreciably poorer nodule production.

Determinations made November 30 on a field sown to barley after tobacco showed an unplanted area to contain 68.7 lbs. of nitrates per 2,000,000 lbs. of soil and the planted area 18.5 lbs. The barley growth on the field, 4,738 lbs. of oven-dry material per acre, contained 156 lbs. of nitrogen, 130 lbs. being in the tops and 26 lbs. in the roots. About 45 per cent of the total nitrogen in the oven-dry tops and roots was water soluble.

[Investigations with legumes in Illinois] (*Illinois Sta. Rpt. 1928, pp. 49–59, fig. 1*).—Further experiments (E. S. R., 58, p. 327) reported on included tests of varieties of alfalfa, sweet clover, red clover, white clover, lespedeza, soy bean selections and hybrids, miscellaneous legumes, and seeding tests with soy beans and red clover.

Trials of forage mixtures by J. J. Pieper demonstrated that much depends upon choice of forage crops composing the seeding mixture. Noteworthy combinations were timothy with red clover and alsike, and alfalfa with timothy. Field peas with oats yielded highest for early emergency hay, and soy beans and Sudan grass for late emergency hay.

The greater winter mortality of southern native and foreign alfalfa in comparisons by W. L. Burlison and J. C. Hackleman seemed to be the result of a combination of susceptibility to disease and insects as well as lower winter resistance. Grimm, Canada Variegated, and South Dakota 12 were outstanding.

In studies by O. H. Sears, W. R. Paden, and F. M. Clark the time when sweet clover was plowed under in the spring seemed to have little effect upon its value for soil improvement, as measured by corn yields and by wheat yields after the corn. Data over several years indicated the practicability of plowing under the sweet clover green manure crop when from 3 to 6 in. high.

Two soy bean lines isolated earlier for high oil content analyzed 19.33 and 18.69 per cent of oil, respectively, in 1927, while two low lines analyzed 16.91 and 16.05 per cent. When high oil plants were crossed with high or low with low in studies by C. M. Woodworth and C. Veatch the hybrids resembled the parents in oil content, while hybrids from crosses of high plants with low plants tended toward intermediacy in oil percentage.

Results by Sears and Clark indicated that some strains of the soy bean nodule organism bring decided improvement in the crop, whereas others are of little if any benefit. Some soy bean varieties seemed harder to infect than other sorts. Sears again observed that some, although not all, strains of cowpea nodule bacteria produce nodules upon the soy bean. Nodule bacteria from other legumes in the same group as the cowpea were found to react in a similar manner. The effect of soy beans upon the succeeding wheat crop seemed to depend upon the available phosphorus in the soil as well as the nitrogen. Phosphated land yielded as much wheat after soy beans as after second year sweet clover, whereas without phosphate wheat yields were 38 per cent less after soy beans than after sweet clover.

Mowing red clover during the fall of the first year increased the yield of hay and seed the coming year in tests by Pieper, W. P. Flint, and J. H. Bigger. The fact that plants tagged in the rosette, blooming, and seed stages were killed 2.5, 3.7, and 13 per cent, respectively, supported the view that plants advanced to the reproductive stage had become too weak to withstand winter and that mowing to keep the plants in the vegetative stage prevented winterkilling and thereby increased hay and seed production. The unmowed plat was heavily infested with field mice, while the mowed plat was practically mouse free. As in previous years the first crop of red clover yielded more seed than the second crop. Clipping red clover in spring of the second year to control insects harmful to seed production lowered yields. Nationality trials of red clover showed Illinois-grown seed to be best, Corn Belt-grown seed next, and Idaho-, Dakota-, and Tennessee-grown seed third. Seed from Oregon, Chile, England, Germany, and France was only fair, and that from southern Europe was poor.

The total weight of weeds in the second year hay crop was about three times greater in red clover not fall mowed the previous year than in the mowed plat. In general, annual weeds were reduced, while winter annuals, biennials, and perennials increased after the mowing. Limestone greatly reduced the total weight of weeds.

[Experimental work on cotton, 1924] (*Egypt Min. Agr., Cotton Research Bd. Ann. Rpt., 5 (1924), pp. 1–35, 41–51, 59–65, 78–85*).—Continued investigations with cotton in Egypt (E. S. R., 55, p. 828) under the Cotton Research Board include breeding work, spinning tests of selected strains, and studies on botanical characters of Egyptian and foreign cottons, pollen forms, growth and blooming, root growth, effect of length of day, ratooning, soil temperatures under cotton and bare fallow, and on alkaline soils. Much of the work has been noted in detail from other sources (E. S. R., 56, pp. 36, 635; 57, pp. 321, 429, 828; 58, p. 634; and 59, p. 226).

Statistics on production and climate are appended.

Nitrogen content in mangels and inheritance of nitrogen content [trans. title], A. Pedersen (*Nord. Jordbrugsforsk., 1928, No. 2–3, pp. 68–101, figs. 3; Eng. abs., pp. 97–100*).—Barres mangels were grown in pots receiving from 0.5 to 24 gm. of nitrogen as sodium nitrate in addition to a nonnitrogenous basic mixture. Analyses of the roots showed that with increase in the nitrogen application the total nitrogen and the nitrate nitrogen rose considerably, whereas only a slight increase was noted in protein nitrogen. In the tops a considerable increase in protein nitrogen, as well as in total nitrogen, was observed, while no nitrates were apparent with less than the 12- and 24-gm. applications. Protein nitrogen decreased regularly with increase in total nitrogen, and nitrate nitrogen rose with total nitrogen. The nitrogen relations in the pot tests are compared with those under natural conditions, and the possibilities and effects of selection for higher nitrogen content are discussed briefly.

The nitrogen relations were fairly constant in roots during storage from November to March.

Variety as a factor influencing the percentage of hull in oats [trans. title], R. Raynaud (*Sci. Agr., 9 (1928), No. 2, pp. 122–127*).—The mean percentages of hull in varieties of oats tested at Macdonald College for from 6 to 9 years ranged from 23 in Alaska to 34.75 in Fifty Pound Black. Varietal differences made it difficult to characterize either the tree or side panicled groups or the early or late groups as having the greater percentage of hull.

A few notes on Indian groundnuts, E. Lieberherr (*Bombay: [Volkart Bros.], 1928, pp. [2]+54, pls. 14, figs. 10*).—A practical treatise on the production, preparation, utilization, and commercial movement of peanuts and peanut products in India.

New tests with potatoes in highlands [trans. title], J. Costantin (*Ann. Sci. Nat., Bot., 10. ser., 8 (1926), No. 3–6, pp. 355–362*).—Studies made in 1926 under conditions described as dry and hence very different from those prevailing in 1925 (E. S. R., 59, p. 641) are described. The yields obtained from potatoes in the highlands were much higher than those obtained elsewhere in France, and are considered to show clearly that mountain potatoes have a remarkable capacity for production.

A program for defense against degeneracy in potatoes [trans. title], J. Costantin (*Ann. Sci. Nat., Bot., 10. ser., 9 (1927), No. 1, pp. 281–284*).—In the account above noted it was claimed that the climate in mountain regions fortifies the potato plant so that its resistance to degenerating factors is increased. The explanation is thought to be derivable from the fact that the mountain life supplies, at least in part, the mycorrhizas which are lacking in the potato as ordinarily cultivated. The wild plants in parts of the Andes (altitude 4,000 meters) are said to show a considerable development of such mycorrhizas.

Investigations on intervarietal differences of a chemical nature in the mature potato tuber, T. P. M'Intosh (*Scot. Jour. Agr., 11 (1928), No. 3, pp. 304–311*).—Preliminary studies indicated the possibility of differentiating potato varieties by chemical tests. The technique of the alkali, oxidase, and nicotine tests, and the blackening of potato tissue and the tyrosinase reaction are outlined briefly. A number of tests gave negative results.

Quality in potatoes, W. M. Findlay (*Scot. Jour. Agr., 11 (1928), No. 3, pp. 339–344*).—Boiling tests made in connection with potato experiments at the Craibstone Farm of the North of Scotland College of Agriculture indicated that quality, as a rule, is generally due to a number of conditions, some of which favor good and others poor quality. The chief factors affecting quality include variety, kind of soil and season, maturity as affected by time of planting and by sprouting the seed, and fertilization. A number of important early, medium, main crop, and late varieties are listed according to cooking quality.

In every season the tubers of four varieties grown on sandy soil were of better quality than those grown on peat or clay. Dry conditions have favored good quality and wet conditions poor quality. Whether the season was wet or dry the tubers of two varieties planted early were much drier than those planted late, a gradual deterioration in quality occurring from the earliest to the latest planting. Early planted sprouted seed gave extremely dry mealy potatoes, while late planted unsprouted seed of the same varieties gave wet soapy tubers.

Excessive use of nitrogenous fertilizers and poorly balanced mixtures were shown to affect quality detrimentally. Of the nitrogen carriers, ammonium sulfate produced the best quality, and superphosphate (acid phosphate) led the phosphates. Omission of phosphates from the fertilizer mixture had a distinctly adverse effect on the quality. Where no potassium was used the tubers of many varieties turned black even during cooking. In dry seasons the sulfate and chloride did not differ much, but in seasons of greater rainfall the sulfate was distinctly superior and the color of the boiled potatoes was better. The low grade potashes were distinctly the poorest. Liming and also the continued use of manure seem to depress quality. Tubers affected with mosaic showed practically no difference in quality, but those where leaf roll was present were much poorer than unaffected tubers.

Harvesting grain sorghums, J. H. Martin, L. A. Reynoldson, B. E. Rothgeb, and W. M. Hurst (*U. S. Dept. Agr., Farmers' Bul. 1577* (*1928*), *pp. II+17, figs. 13*).—Practical information, based chiefly upon a survey of methods used in southwestern Kansas and western Oklahoma in the fall of 1926, is given on the harvesting of grain sorghum by hand heading, binding, cutting with the grain header, combining, and by miscellaneous methods; threshing with the grain separator and the combine; storing heads and threshed grain; drying grain; and using the stover.

The vitality of soybean seed as affected by storage conditions and mechanical injury, C. H. Oathout (*Jour. Amer. Soc. Agron.*, *20* (*1928*), *No. 8*, *pp. 837–855, figs. 4*).—Several varieties of soy beans from the 1924 and 1925 crops were stored under different conditions of temperature, water content, and ventilation at the Illinois Experiment Station. Weather conditions during September and October distinctly affected the water content, germination, and longevity of the beans, being ideal for maturity, harvesting, and threshing in 1924 and the reverse in 1925.

Regardless of the water content at the beginning of storage, a percentage of from 10 to 14 per cent was generally attained in storage where ventilation was afforded. Soy beans holding about this amount kept their vitality unimpaired for over 2 years, regardless of storage conditions. With an appreciably higher water content, ventilation and heat proved to be critical factors affecting the longevity of the beans. Manchu soy beans, 1925 crop, with 15 per cent of moisture and germinating 92 per cent, maintained vitality unimpaired in bin storage until the 1926 seeding season. Noticeable declines in germination were shown by tests in October, 1926, and subsequently, and tests in March, 1927, showed that beans in this lot had so declined in viability as to be unfit for seed, except those stored in a sack with ventilation. Reduction of the high water content enabled beans to prolong their vitality.

Threshing damage cut down germination and was also reflected in size and vigor of plants, the harmful effects evidently being caused largely by development of molds. The effect upon plant growth after germination was not marked in beans with normal moisture content but was very noticeable in those with high moisture. Germination tests showed that vitality decreased more rapidly in the injured than in uninjured soy beans.

Refractometer selection of sugar beets, D. A. Pack (*Facts About Sugar*, *23* (*1928*), *No. 42*, *pp. 1000–1002, fig. 1*).—The development and present status of the method is reviewed, with a description of apparatus designed for sampling sugar beets in the field.

The sugar cane varieties of the 1927 and 1928 crops in Java [trans. title], W. J. Heyligers (*Arch. Suikerindus. Nederland. Indië, Meded. Proefsta. Java-Suikerindus., 1928, No. 4, pp. 153–193*).—Data tabulated on the distribution of sugar cane varieties in Java showed the varieties in order of importance in the 1927 crop to be E. K. 28, D. I. 52, P. O. J. 2878, other P. O. J. strains, and E. K. 2, occupying, respectively, 35.25, 26, 12.5, 10.5, and 4 per cent of the total acreage planted to cane on the island. Estimates on the 1928 acreage showed P. O. J. 2878 with 66.5 per cent, E. K. 28 with 13 per cent, and D. I. 52 with 11.75 per cent.

Sugar-cane experiments, 1924–1926, J. DE VERTEUIL and L. A. BRUNTON (*Trinidad and Tobago Dept. Agr. Bul., 21 (1927), No. 2, pp. 71–91*).—Trials of sugar cane seedlings and varieties and cultivation and fertilizer tests are described for the period indicated. Of canes grown during the past 4 or more years the best results were had from Ba. 11569 with 4.12 tons of indicated sucrose, B. H. 10(12) with 3.94 tons, and Ba. 8409 with 3.76 tons.

A preliminary note on the effect of manurial constituents on the quality of sugarcane juice and gur, P. B. SANYAL (*Agr. Jour. India, 23 (1928), No. 4, pp. 277–286, figs. 3*).—The study reported earlier from the Agricultural Research Institute at Pusa (E. S. R., 59, p. 223) is described in some detail. As was observed in the case of the juice, the crude sugars (gur) from plats treated with superphosphate (acid phosphate) and with potassium were much higher in quality than those from plats receiving nitrogenous fertilizers. A plat treated with mustard cake also yielded crude sugar of low quality.

Effect of the continuous selection of large and small wheat seed on yield, bushel weight, varietal purity, and loose smut infection, J. W. TAYLOR (*Jour. Amer. Soc. Agron., 20 (1928), No. 8, pp. 856–867*).—Purplestraw wheat was grown in 1921 at Arlington, Va., between plats of Abruzzi rye and Fulcaster (Bearded Purplestraw) wheat, and the resulting crop of Purplestraw seed was sorted into large and small sizes. In subsequent years, including 1927, the large seed was sorted annually from the crop of the large-seed plats of the previous harvest and the small seed from the crop of the small-seed plats.

Increased grain yields were obtained in all years except the first from the use of large wheat kernels. The bushel weight of the grain produced by large seed was the heavier in four of the six years, but the differences were small and inconclusive. Large seed produced a higher percentage of large kernels than small seed in each of five years.

Hybrid kernels of natural crosses between wheat and rye, being small, were sorted automatically into the small seed in 1922 and 1923. In the 1922 crop there was an average of 19 F_1 wheat-rye hybrids in each of seven small-seed plats as compared to one in all seven large-seed plats, while seed from unsorted Purplestraw wheat averaged one wheat-rye hybrid to the 1/40-acre plat. Somewhat different numbers were observed in 1923.

Seeds of fully awned wheat rogues, possibly due to natural crossing between Purplestraw and Fulcaster, were sorted into the large seed, being themselves large, and the number in the large seed plats increased rapidly in each of four years in which data were recorded, greatly exceeding the number in the small-seed plats and in unsorted Purplestraw seed. Three times as many loose smutted heads occurred in the small-seed plats as in large-seed plats in 1926 and over five times as many in 1927 and four times as many as in unsorted Purplestraw seed.

Effect of stage of maturity on composition and baking quality of Marquis wheat, C. E. MANGELS and T. E. STOA (*Cereal Chem., 5 (1928), No. 5, pp. 385–394, fig. 1*).—Marquis wheat harvested in the dough, hard dough, glazed, normal ripe, dead ripe, and extra late stages of maturity during 1924, 1925, 1926, and 1927 at the North Dakota Experiment Station was subjected to milling and baking tests.

The grain harvested in the dough and hard dough stages averaged lower in yield and test weight per bushel than when cut at a more mature stage. The protein content of wheat showed no consistent variation at different stages of maturity for different seasons. Variation in prevailing climatic conditions during the maturing period seemed responsible for inconsistency in protein content variation for different stages of maturity. The protein content of patent flour from 1927 crop samples varied the same as protein in wheat. Ash decreased as the wheat matured, but the sugar content remained constant from the dough to the extra late stage.

Baking tests with straight grade flours from the wheat harvested at the several stages of maturity showed slightly better quality for the mature wheats. Patent flours from wheat of the 1927 crop harvested at different maturity stages showed no significant difference in loaf volume or color, but the dough and hard dough stages were lower in texture. The nitrogen distribution in flour from different maturity stages showed less variation than would be expected. Glutenin remained practically constant but tended to decrease in the dead ripe and extra late stages. Nitrogen soluble in 70 per cent alcohol increased consistently with maturity, while nitrogen soluble in a 5 per cent solution of potassium sulfate showed a consistent decrease. Nitrogen not precipitated by tungstic acid and amino nitrogen was highest in the dough stage but remained practically constant after the glazed stage. The diastatic activity showed a tendency to decrease as wheat matured.

A comparison of some properties of normal and frosted wheats, A. H. Johnson and W. O. Whitcomb (*Montana Sta. Bul. 204 (1927), pp. 66, figs. 9*).—Marquis wheat frosted at different stages of maturity in several seasons was subjected to quality, germination, milling, and baking tests. Earlier and related studies have been noted (E. S. R., 56, p. 133; 59, p. 331).

The severity of the damage appeared to depend upon the moisture content of the wheat kernels at the time of frost and the temperature and duration of such frost, a temperature of from 29 to 27° F. being low enough to cause frost damage in immature wheat. While degree of maturity had little relationship to germination in normal wheat, germination decreased as the kernels were the more immature at time of freezing. Frosted wheat had a lower weight per bushel than nonfrosted wheat. Green color in wheat frosted when very immature was observed to change to more nearly the color of normal wheat if allowed to stand in the field some time before cutting.

Compared to flour from normal wheat, that from frosted wheat was similar in crude protein content, higher in amino nitrogen compounds, ash, and reducing sugars, and lower in viscosity of acidulated extracted flour-water suspensions. The degree of maturity and severity of frost damage also affected the differences noted. During autodigestion more protein was broken down and reducing sugars formed more rapidly in the frosted wheat flour than in comparable normal wheat flours. It appeared that wheat frosted when containing from 44 to 46 per cent or less of moisture, i. e., in the stiff dough stage, could produce as good bread as normal wheat harvested at the same time.

Longevity of crop seeds, K. M. Sonavne (*Agr. Jour. India, 23 (1928), No. 4, pp. 271–276, figs. 2*).—In longevity tests at the Poona College of Agriculture with seed of 16 cereals, legumes, and other crops, each dry clean sample was divided into 16 subsamples stored separately in sealed glass bottles containing a naphthalene ball. Each bottle was a year's sample, and was tested every 3 months. With the exception of peanuts, and to a lesser extent pearl millet, all crops lost little in germinability during 5 years. The hard seed in the legumes tested evidently became permeable within a year after harvesting and storage.

Results of seed tests for 1928, B. I. GLIDDEN (*New Hampshire Sta. Bul. 235 (1928), pp. 17*).—Tables show the percentages of purity and germination for 314 official samples of field crop seed collected in New Hampshire and tested during the year ended June 30, 1928.

HORTICULTURE

[Horticultural investigations at the Illinois Station] (*Illinois Sta. Rpt. 1928, pp. 254–259, 264, 265, 266, 267, 269–274, 277–299, figs. 6*).—The usual annual report (E. S. R., 58, p. 332).

Up to the close of the 1927 season, fruits had been described from a total of 11,707 hybrid and 2,518 open pollinated apple seedlings. A total of 47 native and foreign crabs and 52 named orchard varieties have been utilized in these breeding studies conducted by C. S. Crandall and J. C. Blair. Peach breeding studies were also continued with the propagation of promising seedlings.

Fruit variety tests conducted by R. L. McMunn indicated that the Duke group of cherries is not adapted to the region. Sour cherries proved especially satisfactory and sweet varieties fruited. Among plums, varieties from native species or crosses with natives were most productive. Some of the domestica plums, Gueii, Lombard, Monarch, Tatge, and Imperial Gage did well, but the Japanese group proved a failure.

Pruning studies by W. A. Ruth and V. W. Kelley with young apple trees developed the fact that cutting back the central leader during the growing season not only stimulates laterals during the current season but also in the subsequent year. A very large proportion of the laterals developing the second season formed wide angles with the main shoot and were particularly valuable for scaffold limbs. The technique employed in framework building is discussed.

Fertilizer studies conducted by M. J. Dorsey and R. S. Marsh, though adversely influenced by a heavy preceding crop and low temperature injuries, demonstrated that fertilizers aid production in unfavorable seasons. Large applications of nitrate of soda had a slightly reducing effect on fruit color. That apple roots have notable resistance to injury from surface water was observed by Ruth in a study at Olney. Trees purposely flooded in the summer of 1926 and 1927 showed no visible foliage or fruit injury, and very few of the roots were killed or injured. Ruth and Kelley found that repeated annual dormant pruning of mature Grimes and Jonathan trees had a marked decreasing influence on yield, from 40 to 50 per cent. It is pointed out, however, that the records were taken on an off-crop year. The pruning of Duchess and Wealthy trees of an age about to bear delayed the initiation of fruiting. About 95 per cent of the unpruned trees bore in 1927 as compared with 70 per cent for the severely thinned trees. The quantity produced was much more adversely influenced. Though pruning increased the size of Duchess apples, the result was immaterial, since practically all of the apples were of marketable size. Thinning investigations conducted by Dorsey and McMunn with peaches are again reported (E. S. R., 60, p. 44).

Working in the station orchard McMunn found that applications of nitrogenous fertilizers did not increase yields of 10-year-old sour cherries. Heavy pruning reduced yields, but light pruning caused only slight reduction, which was offset by better colored fruits and greater ease in spraying and picking. The size of the cherries was but little influenced by any treatment. There was very little difference in average yield per tree between the nonpruned and nonfertilized trees and those receiving light pruning and nitrogen. Irrespective of fertilizer treatment yields were reduced on the heavily pruned trees.

A. S. Colby reporting on tests of small fruits and nuts comments favorably upon the Ontario grape, a product of the New York State Station, and upon the Latham raspberry, originating from the University of Minnesota. Raspberries varied greatly in their resistance to mosaic and other diseases. Perfection was very susceptible to mosaic, while St. Regis seemed quite resistant. The Quillen black raspberry was strongly resistant to anthracnose. No raspberry was found resistant to crown gall, although the purples because of their greater vigor seemed to endure its attack better.

Colby found that a number of grape varieties may be stored successfully when properly picked and handled. Varieties keeping until mid-January are Agawam, Bacchus, Brighton, Catawba, Clinton, Delaware, Eumelan, Gaertner, Goethe, Herbert, Hubbard, Niagara, and Urbana. Two more European grapes, Black Hamburg and Muscat Rose, were found adaptable in Illinois but need protection in winter. Of various systems of vine training tested the 4-arm Kniffin is deemed best for the Concord grape. A range of from 46 to 55 buds per vine was found satisfactory considering yield, size, and attractiveness of clusters. Larger yields were obtained with from 56 to 65 buds. Gooseberry breeding was continued. Attempts to breed black raspberries resistant to anthracnose showed the Quillen to be a potent parent of resistant seedlings. In reciprocal crosses between June and Plum Farmer it was found that a greater number of resistant seedlings were obtained when the black variety, Plum Farmer, was used as the ovule parent. The range in susceptibility of raspberries is held to suggest that anthracnose resistance is determined by more than a single genetic factor. The overhead irrigation of strawberries did not significantly increase yields in 1927 because of adequate rainfall.

A number of large fruited Japanese quinces having value as sources of jelly were selected by Colby. Other promising dual purpose fruits include the June berry, elderberry, eleagnus, American high-bush cranberry, sand cherry, and Nanking cherry. Fertilizers had no material influence on yield, growth, or time of blooming of the Eldorado blackberry, nor was winter injury correlated with the season of applying fertilizers.

Market gardening studies conducted by J. W. Lloyd again suggested that satisfactory production may be maintained with cover crops and commercial fertilizers. Cauliflower, kale, lettuce, and onions responded strongly to applications of phosphorus. Early beets, potatoes, salsify, spinach, and turnips benefited from potash. Top-dressings of nitrate of soda increased yields of many vegetables. No treatment fully equaled that of animal manure, but studies conducted in Cook County by Lloyd and E. P. Lewis further bore out the value of commercial fertilizer when supplemented with organic materials. Phosphorus promoted early maturity as well as total yields in sweet corn and pickle cucumbers. Nitrogen and potash were not as important as phosphorus in respect to earliness. In the case of cabbage, nitrogen and phosphorus produced yield increases up to the maximum amount used. Onion sets showed increased yields from the largest applications of nitrogen and phosphoric acid and medium potash. In tests with various vegetables, manure alone, 20 tons per acre, was not as effective as was 10 tons supplemented with phosphoric acid. The application of 3 tons of ground limestone without fertilizer increased yields of all crops except peppers. When used with manure rock phosphate was less effective than superphosphate (acid phosphate). Bone meal was not equal to superphosphate as a manure supplement.

As established by Lloyd and Lewis, cutting asparagus for even 2 weeks during the year following setting was a harmful practice. Selection studies with Golden Bantam sweet corn and other vegetables showed material progress.

The Marglobe tomato proved to be a good market variety. Copper dust proved somewhat better than sprays for pest control with vegetables.

W. A. Huelsen and M. C. Gillis working with sweet corn have isolated by self-pollination some highly desirable breeding strains of Country Gentleman and Narrow Grain Evergreen. Tests with a "penetrometer" showed that soil treatment had no visible effect on the tenderness of kernels, but when pure lines were examined very great differences were noted in tenderness. Starchiness and toughness were not necessarily associated since one extremely starchy strain was the most tender one found. Comparing the relative merits of hill and broadcast applications of fertilizers, Huelsen and Gillis found that hill applications brought higher increments in yield. One hundred lbs. of a 0–16–6 fertilizer in the hill proved more profitable than 400 lbs. broadcast.

That disease resistant selections of cabbage are often late in maturing was found by Lloyd in a test of several introductions. Gillis working with bush beans found that thick planting increased yields. Continuing their work in developing wilt resistant tomatoes, Huelsen and Gillis report substantial progress.

Lloyd and H. M. Newell, studying various means of reducing fruit and vegetable losses in transit, found that the type of receptacle, the stage of maturity at time of picking, and the temperature of cars were all factors of importance.

Breaking the rest period of the gladiolus with ethylene chloride or ethylene hydrochloride was found possible by F. F. Weinard and S. W. Decker, but unfortunately erratic results followed the treatment; in fact some of the treated corms did not bloom at all. The slight improvement in the length of stem of roses from plants set in new soil was not sufficient, according to Weinard and S. W. Hall, to justify the annual change of the soil. Carnations, on the other hand, seemed to require soil changing, as the yields up to April were about 20 per cent less on old than on new soil. A total of 373 varieties of peonies was examined by H. B. Dorner and Weinard in an attempt to clarify nomenclature in this flower. It was found by Weinard and Decker that the mulching of peonies with manure induced weak stems and encouraged blight. Phosphorus was beneficial to the peony, as was also nitrogen in moderate amounts, while potash is described as probably of value. An increased number of buds was produced on plants treated with superphosphate or steamed bone and nitrate of soda. Nitrogen fertilizers strikingly influenced the color of peony plants.

Effect of peat moss and sand on rooting response of cuttings, A. E. HITCHCOCK (*Bot. Gaz., 86 (1928), No. 2, pp. 121-148, pls. 3, figs. 5*).—Studies at the Boyce Thompson Institute, Yonkers, N. Y., with 96 varieties of cuttings representing 46 genera led to a classification into three groups, (1) those rooting readily in peat moss but poorly in sand, (2) those rooting readily in sand but poorly in peat moss, and (3) those which rooted readily in either medium. The fact that all cuttings rooted readily in a half-and-half mixture of peat moss and sand suggest that such a mixture is superior to either sand or peat moss as a general rooting medium. Good rooting for most varieties occurred within the pH range of 4.5 to 7. Whether peat moss was used in its natural acid state, neutralized, or mixed with sand, root growth proceeded more rapidly than in sand alone.

The flowering habit of cabbage [trans. title], F. KOTOWSKI (*Rocz. Nauk Rolnicz. i Leśnych (Polish Agr. and Forest. Ann.). 19* (*1928*), *No. 1, pp. 25–40, figs. 7; Eng. abs., pp. 39, 40*).—In studies with cabbage at the College of Agriculture, Warsaw, Poland, the author found that the curve of flower production could be expressed quite accurately by the equation of an autocatalytic chemical reaction. The main stalk flowered over a longer period and produced about eight times as many flowers as did each of the side stalks. The main stalk represented one flowering cycle as compared with two for the side branches. The early opening blossoms produced the best seeds.

Tomato experiments, 1927–28, R. Thomson (*Agr. Gaz. N. S. Wales, 39 (1928), No. 8, pp. 597–602*).—In trials conducted at the Bathurst Experiment Farm, New South Wales, irrigated tomato plants greatly outyielded the non rrigated. The outstanding varieties were Bonny Best, Norton, Norduke, and Chalk Early Jewel. Marglobe was very promising. Superphosphate (acid phosphate), wood ashes, and manure proved a satisfactory fertilizer in the plant bed, and superphosphate proved a valuable fertilizer in the field. Lime alone had no beneficial influence but when combined with superphosphate increased yields beyond those obtained with superphosphate alone.

Effects of pruning on the carbohydrate-nitrogen ratio in the tomato, A. E. Murneek (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 180–184, figs. 2*).—That the carbohydrate-nitrogen ratio may be influenced in herbaceous plants was indicated in the results of analyses of tomato plants submitted to various degrees of leaf and root pruning. When nitrogen was not a limiting factor, both vegetative development and reproduction were in proportion to the amount of foliage removed. The removal of leaves was accompanied by a parallel reduction in the carbohydrate-nitrogen ratio. In the case of root-pruned plants the removal of 35 per cent of the roots had practically no effect either on the behavior of the plant or upon the carbohydrate-nitrogen ratio. This was accounted for by a very rapid regeneration of roots. The removal of 70 per cent of the roots materially influenced growth and fruiting and lowered the carbohydrate-nitrogen ratio. The author concludes that leaf pruning is the most effective means of changing the carbohydrate-nitrogen ratio in the tomato.

Tomatoes under Vita glass, R. Thomson (*Agr. Gaz. N. S. Wales, 39 (1928), No. 8, p. 596*).—In a test at the Bathurst Experiment Farm, New South Wales, tomato plants grown in frames covered with Vita glass suffered injury which on the basis of comparative temperature records was believed due to excessive heat.

Winter root growth of plants, F. J. Crider (*Science, 68 (1928), No. 1765, pp. 403, 404*).—At the Boyce Thompson Southwestern Arboretum, Arizona, it was found that various trees generally thought to be dormant in winter made definite continuous root growth. Among such species were the peach and the apricot. Root elongation reached the minimum in February, a fact which is believed to be the result of seasonal changes in the temperature of the soil. Diurnal temperature changes were not manifested. For the peach the average daily root growth for November was 5.55 mm., for December 2.01, for January 1.65, for February 0.9, and for March 1.16 mm. Other plants, including the orange and the vinifera grape, made no root growth whatever during the same period.

Fruit-growing projects, F. C. Sears (*New York: Macmillan Co., 1928, pp. XXIII+383, pl. 1, figs. 256*).—The various operations in the management of orchards and small fruit plantations are presented in a form suitable for use in instruction on a project basis.

A new method for use in apple thinning experiments, H. A. Rollins (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 93, 94*).—As determined by records taken on paired trees, the thinning in July of Baldwin apples to 6 in. apart increased the average diameter of the fruits by 0.124±0.027 in. and the average color per fruit by 4.03±1.67 per cent. In one heavily loaded orchard the gain in diameter amounted to 0.23±0.05 in. In this case the color increase was 8.32±2.08 per cent. Thinning decreased the average yields by 199±36.2 lbs. per tree. Thinning had very slight effect on the uniformity of the fruit, the coefficient of variability for size from unthinned trees being 6.85±0.66 per cent as compared with 6.7±0.24 per cent for the thinned trees. The differences were slightly greater in the case of color.

Apples as fillers in apple orchard (*Kentucky Sta. Rpt. 1927, pt. 1, pp. 30, 31*).—Observations in the station orchards indicated that permanent trees should be planted more than 33 ft. apart so that the filler varieties selected for early maturity may have a longer time in which to produce.

Pollination of cherries and pears [trans. title], H. Kamlah (*Gartenbauwissenschaft, 1 (1928), No. 1, pp. 10–45, figs. 10*).—Studies at the University of Halle led to the following conclusions and results:

The percentage germination of pollen is not a practical measure of the pollinizing value of a variety. The more or less satisfactory germination of pollen in the stigmatic fluid of another variety was found no indication of the reciprocal fertility of the two varieties. All sweet cherry and pear varieties tested proved self-sterile. Among cherries the Kunze and Lucien, the Kunze and May Bigarreau, and the Kassin Early and White Spanish varieties proved intersterile. Among pears the Diel proved an unsatisfactory pollinizer for the Bartlett, Bosc, and Clapp Favorite. The Clapp Favorite×Diel combination was reciprocally sterile. In descending order Bosc, Hardenpont, and Clapp Favorite were found satisfactory pollinizers for Bartlett. The necessity of a seed count as a measure of the pollinizing value of any pear is emphasized. The Early French, Büttner, and Schneider cherries proved good pollinizers, and the Morello cherries were found completely self-fertile. Sweet cherries were good pollinizers for sour varieties, but the reciprocal crosses were not successful.

Pollination, an important factor in successful pear production, S. Johnston (*Mich. State Hort. Soc. Ann. Rpt., 57 (1927), pp. 196–199*).—Bartlett and Seckel pear trees inclosed in a single cage with bees failed to set fruit. The intersterility of these two varieties was further demonstrated by hand pollination. Bosc, on the other hand, proved a satisfactory pollinizer for Bartlett. Studies with Bartlett, Bosc, Seckel, Kieffer, Howell, Flemish Beauty, Anjou, and Clapp Favorite showed all, with the exception of Flemish Beauty, to be commercially self-sterile. Successful pollinizers are suggested for the several varieties. Wind was found entirely ineffective in pollination, since emasculated, uncovered blooms failed to set any fruit. It is suggested that for best results one compatible pollinizer be set for every 8 trees.

Cross and self-pollination studies with the peach in Maryland, W. L. Kerr (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 97–101*).—Determinations at the University of Maryland upon the flowers of most of the varieties of peaches grown commercially in the State showed J. H. Hale and June Elberta entirely self-sterile and Alton, Belle of Georgia, Greensboro, Red Bird Cling, and Rochester insufficiently self-fruitful. Smock failed to develop its fruit properly under the paper sacks. Of 27 varieties tested as pollinizers for J. H. Hale, 22, including such well-known peaches as Belle of Georgia, Early Elberta, Elberta, Hiley, and Late Crawford, gave good results. Carman, Edgmont, Smock, and Rochester did not produce satisfactory sets. June Elberta is considered of little value as a Hale pollinizer on account of its low pollen viability. Elberta, Early Elberta, and Belle of Georgia are recommended as the most desirable commercial pollinizers for J. H. Hale under Maryland conditions.

The J. H. Hale situation in Illinois, M. J. Dorsey (*Ky. State Hort. Soc. Trans., 1927, pp. 105–116*).—Studies by the Illinois Experiment Station upon the pollen of J. H. Hale peaches revealed a few normal pollen grains which grew in a 20 per cent sugar solution. Admitting that this extremely small percentage of normal grains is inadequate for pollination, the author points out that pollen production in this variety is evidently a variable character in view of the fact that other investigators, notably Connors (E. S. R., 57, p. 737), have reported no normal pollen.

Studies of the nature of the small, stunted peaches, "buttons," collected 69 days after bloom showed embryos and endosperm tissue in some, with others devoid of all nuclei. In no case did the embryo reach a size that could be seen readily with the naked eye. The processes which lead up to "button" formation are deemed to be intimately associated with fertilization and embryo development.

Tests with twigs cut 76 days after bloom and placed in water in the laboratory showed the small buttons to dry out first, then the larger ones, and finally the normal fruits, indicating that normal fruits do not suffer in competition with the buttons and hence the inadvisability of going to the expense of removing the buttons.

Observations on the pollination of J. H. Hale peach trees adjacent to Elbertas and 50 rows away showed approximately the same percentage set, 32.4 and 33.1, respectively. Subsequent study of the anthers of the flowers of the same trees showed them to be large, plump, and full of viable pollen. These trees evidently constituted a distinct strain, temporarily designated as Husky Hale. Extended observations showed widespread distribution of this perfect flowered type, especially in the younger peach orchards of the State. Whether this new type is a nursery mixture or a fertile sport of J. H. Hale is an unsolved question.

Some studies on the hardiness of certain species of Vaccinium, W. G. Brierley and A. C. Hildreth (*Plant Physiol., 3 (1928), No. 3, pp. 303–308*).—Checking field observations with laboratory determinations it was found at the University of Minnesota that the three species of blueberry, *V. canadense*, *V. pennsylvanicum*, and *V. corymbosum*, are relatively tender as compared with many trees and shrubs. The killing point at the end of October for *V. corymbosum* and *V. canadense* was between −16° and −20° C. (3.2 and −4° F.). *V. pennsylvanicum* was somewhat more resistant to cold, injury occurring at about −24.5°. The authors believe that the blueberry relies on snow protection rather than on the actual resistance of the tissue to cold. From the viewpoint of this experiment none of the species are considered promising for breeding for increased resistance.

Two ancient fallacies and their bearing on viticultural practice, F. T. Bioletti (*Mich. State Hort. Soc. Ann. Rpt., 57 (1927), pp. 180–196, figs. 3*).—Two hypotheses, namely, that pruning invigorates the vine and that bud selection on the basis of crop records is a means of increasing the productivity of a grape variety, are described as fallacious in the light of results of studies at the California Experiment Station (E. S. R., 55, p. 440).

Olive culture in the Province of Seville, A. Fernandez Latorre (*Cultivo del Olivo en la Provincia de Sevilla. Seville: Zarzuela, 1927, pp. XI+397, figs. 118*).—A general discussion upon culture, propagation, pruning, spraying, varieties, etc.

Variations in the yields of cacao trees at Asuansi Experiment Station, G. G. Auchinleck, A. B. Culham, and J. Steele (*Gold Coast Dept. Agr. Bul. 13 (1928), pp. 67–73, pls. 2*).—Records taken for 8 consecutive years on the yields of individual trees in a cacao plantation at Asuansi, Gold Coast, showed certain trees to be distinctly superior in respect to continued high productivity, even after due allowances were made for variability of the soil. The total yields showed a distinct tendency toward a cyclic production, 2 years high and 1 year low.

Variations in the yields of cacao trees at Aburi Experiment Station, 1914–1926, G. G. Auchinleck and G. H. Eady (*Gold Coast Dept. Agr. Bul. 13 (1928), pp. 74–77*).—An analysis of 13 years' records upon the yields of individual cacao trees comprising a plantation at Aburi, Gold Coast, showed distinct variability, further indicating the need of propagating from selected trees.

A preliminary report on dichogamy in the pecan, G. W. Adriance (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 95–97*)—Observations over a 3-year period on the flowers of seven pecan varieties showed a marked variation from year to year in the order of appearance of the male and female flowers. In 1925 four of seven varieties were protogynous (female flowers first). In 1926 only one and in 1927 only two of the seven were protogynous. Bolton was the only variety to remain constantly protogynous, and Texas Prolific, San Saba, and Rome were continuously protandrous (male flowers first). Since the spring of 1925 was conspicuously warm, the author suggests that female flowers suffer greater retardation from lack of heat than do the male flowers, but he believes that other factors probably bear upon this phenomenon.

The problem of species in the northern blue flags, Iris versicolor L. and Iris virginica L., E. Anderson (*Ann. Missouri Bot. Gard., 15 (1928), No. 3, pp. 241–332, pls. 11, figs. 21*).—The common wild blue iris or flag of eastern North America was found to occur as two distinct species, *I. versicolor* and *I. virginica*. Wide variation was observed within each species, with no tendency of species merging. Along the narrow zone where the species meet some evidence was seen of hybridization. Artificial crossing showed the two species to be partially interfertile as compared with approximate full fertility between varieties within either species. In the species cross the resulting seed had low viability and the seedlings displayed heterosis or hybrid vigor.

Narcissus for garden and home, H. M. Biekart (*New Jersey Stas. Circ. 204 (1928), pp. 26, figs. 8*).—A general discussion upon narcissus types and varieties, culture, forcing, and pests and their control.

The effect of aluminum sulphate on rhododendrons and other acid-soil plants, F. V. Coville (*Smithsn. Inst. Ann. Rpt. 1926, pp. 369–382, pls. 13*).—A summary of the results of investigations upon the culture of various acidophilous plants (E. S. R., 48, p. 839).

Rock gardens, F. F. Rockwell (*New York: Macmillan Co., 1928, pp. X+86, figs. 20*).—Useful information is presented on construction, culture, plants, etc.

The book of shrubs, A. C. Hottes (*New York: A. T. De La Mare Co., 1928, pp. VIII+371, pl. 1, figs. 165*).—A practical discussion upon the culture of ornamental shrubs, with brief descriptions of most of the common species and varieties, accompanied by notes on their special requirements in respect to soil, fertilizers, and pruning.

FORESTRY

Report of the director of forestry, 1926–7, E. H. Finlayson et al. (*Canada Dept. Int., Rpt. Dir. Forestry, 1927, pp. 51, figs. 13*).—This is the administrative report for the year ended March 31, 1927, and contains general references to various research activities.

Forestry in Wisconsin: Official report of the Wisconsin Commercial Forestry Conference, 1928 (*Milwaukee: Wis. Com. Forestry Conf., H. L. Ashworth, Secy., 1928, pp. [7]+194, pls. 16, figs. 4*).—This is a report of the conference held at Milwaukee in March, 1928.

Silvicultural systems, R. S. Troup (*Oxford: Clarendon Press; New York: Oxford Univ. Press, Amer. Branch, 1928, pp. XII+199, pls. 40, figs. 24*).—Various silvicultural systems, such as clear cutting, shelter wood, strip, coppice, etc., are carefully described, and the principles and methods employed in the utilization of the systems are discussed with the aid of extensive illustrations.

Measurement of physical factors in silviculture, G. A. Pearson (*Ecology, 9 (1928), No. 4, pp. 404–411*).—Investigations conducted in Arizona and New Mexico by the Southwestern Forest Experiment Station indicated that the upper altitudinal limit of each species is determined by low temperature and the lower altitudinal limit by deficient moisture. Under the conditions of the experiment neither high temperature nor high moisture appeared to be direct limiting factors to any species. A table is presented showing the minimum temperature and moisture conditions under which various forest trees usually grow in northern Arizona, and the application of the data to silvicultural practice with several of the species is discussed. The author points out the value of exact data in supplementing observational methods and ordinary judgment. The effects of heat and moisture are often confused, and abnormalities of growth usually attributed to deficient light may be due to deficient heat. Suitable air temperatures decreased the need for direct insolation.

Trends and silvicultural significance of upland forest successions in southern New England, H. J. Lutz (*Yale Univ. School Forestry Bul. 22 (1928), pp. 68, pls. 19, figs. 5*).—Studies of the upland forests of southern New England showed three distinct associations, the red cedar-gray birch association, the hardwood association, and the hemlock-hardwood association. The general characteristics, taxonomic features, distribution, and successional relations are discussed for each of the associations. Anthropeic influences are considered, and illustrative examples of typical representatives of each association are given. The silvicultural significance of the upland forest associations is considered and silvicultural policy and practice discussed.

The effect of spacing on the height growth of beeches [trans. title], H. Schmied (*Centbl. Gesam. Forstw., 54 (1928), No. 9, pp. 260–284*).—A spacing experiment begun in 1894 with beech trees then 18 years of age led to the following conclusions: Height and diameter growth were significantly influenced by the spacing, with greater effect on diameter than on height; close spacing stimulated height growth, while open planting had the opposite effect; and all stem classes showed greater variability in diameter growth than in height. In summation the author points out that it is not favorable to the beech to allow abundant light in the early years with the idea that later growth will cause self-pruning. The beech must grow in close stands from its early youth and may only be released for the purpose of making thicker growth after the desired height has been attained.

Calcium, the key to forest productivity, G. S. Perry (*Jour. Forestry, 26 (1928), No. 6, pp. 767–773*).—Records taken on white pine, shortleaf and pitch pines, Jersey scrub pine, and black oak grown side by side upon irrigated and nonirrigated soil at the Mont Alto nursery, Pennsylvania, showed no significant differences in growth that could be attributed to the water supply. The author suggests that the growth differences hitherto ascribed to water relations may in fact be due to variations in the calcium content of the soil.

Hastening the germination of southern pine seeds, L. V. BARTON (*Jour. Forestry, 26 (1928), No. 6, pp. 774–785, figs. 5*).—Studies at the Boyce Thompson Institute, Yonkers, N. Y., with seeds of *Pinus echinata*, *P. palustris*, *P. caribaea*, and *P. taeda* showed that stratification for 1 or 2 months at 0, 5, 10, and 15° C. or for 1, 2, 3, or 4 months at 0 or 5°, except for *P. palustris*, hastens germination and increases the seedling stand. Two months at 5° is suggested as a desirable treatment for all species except *P. palustris*, for which 1 month at 5° or 1 or 2 months at 0° is recommended.

Climatic strains of Douglas fir [trans. title], E. MÜNCH (*Centbl. Gesam. Forstw., 54 (1928), No. 9, pp. 254–260, fig. 1*).—A further report (E. S. R., 51, p. 648) upon cultural experiments in progress near Kaiserslautern, Rhine Palatinate, Germany, with Douglas fir trees raised from seed obtained from different locations in the United States, namely, the Pike, Sopris, San Isabel, Pecos, Madison, Bitterroot, Lolo, Salmon, Colville, and Snoqualmie National Forests.

The trees raised from seed obtained from the Snoqualmie forest have maintained their supremacy in height growth throughout. The maximum heights of the several lots in 1927 after 18 growing seasons were, respectively, 4.6±0.13 meters, 4.3±0.16, 5.2±0.15, 6.4±0.13, 4±0.22, 5.4±0.11, 4.9±0.21, 3.6±0.22, 3.8±0.13, and 10±0.25 meters. The Snoqualmie Douglas fir trees had thus made almost three times the total growth of the slowest growing lot. The results again emphasize the desirability of using seed from known sources.

A key to the species of Eucalyptus grown in California, E. WALTHER (*Calif. Acad. Sci. Proc., 4. ser., 17 (1928), No. 3, pp. 67–87*).—A simple key is offered as a means of aiding in the identification of the many California species.

Tapping experiments [trans. title], W. BALLY (*Arch. Rubbercult. Nederland. Indië, 12 (1928), No. 4, pp. 268–301, figs. 3; Eng. abs., p. 301*).—With results analyzed statistically by the Student method, no significant differences in yield were found between alternate day and alternate month tapping of trees tapped for the first time. When the alternate month plan was changed to an alternate 2 weeks plan these trees outyielded the alternate day trees by approximately 30 per cent. No differences in bark consumption or disease relations were noted. In a comparison of alternate month with daily tapping the alternate month trees increased more rapidly in yield. One month tapping followed by a rest period of 2 weeks resulted in from 25 to 30 per cent larger yields than those of alternate day tapping. No significant differences could be found between the yields of alternate day trees and those tapped with a 20-day rest period.

Forest insurance and its application in Michigan, P. A. HERBERT (*Michigan Sta. Spec. Bul. 179 (1928), pp. 34*).—Insurance is deemed a necessary adjunct in the business of forestry just as it is in other commercial enterprises that require security. The profits obtainable from growing forest trees, even with a deferred yield tax, are not sufficient to counterbalance the risk that remains after protective efforts have been increased to an economic maximum. Deferred taxation does not necessarily reduce the tax bill but reduces the holder's risk from fire and other possible losses. Self insurance, because of the risk of large conflagrations, is considered out of reach of most timber land owners. Present forest insurance costs in the United States are beyond the reach of the majority of owners and are considered higher than necessary. Lower rates and greater demand for insurance will go hand in hand with better protection and higher stumpage values. European experiences are considered but are deemed to be more of an indicator than a guide to American forest insurance practice.

DISEASES OF PLANTS

Agricultural plant diseases and their control, E. RIEHM (*Die Krankheiten der Landwirtschaftl. Kulturpflanzen und ihre Bekämpfung. Berlin: Paul Parey, 1927, 3. ed., rev., pp. VIII+192, figs. 121*).—A general account is followed by a more specialized portion dealing in systematic form with plant injuries and agents, the latter including injurious animals.

Bibliography of the literature of plant protection, 1926, H. MORSTATT (*Biol. Reichsanst. Land u. Forstw. Berlin-Dahlem, Bibliog. Pflanzenschutzlit., 1926, pp. IV+231*).—An introductory section is followed by three dealing with plant diseases and their causation, injured plants, and means of protection. See also previous notes (E. S. R., 54, p. 447; 56, p. 647).

[Plant disease investigations at the Illinois Station] (*Illinois Sta. Rpt. 1928, pp. 69–73, 261–264, 267–269, 274–277, 299, 300, fig. 1*).—These investigations are mostly in continuation of work previously reported upon (E. S. R., 58, p. 337).

[*Corn ear rot investigations*]. Investigations by B. Koehler, G. H. Dungan, and J. R. Holbert have again shown that careful selection of seed corn resulted in an appreciable reduction of the Fusarium type of ear rot, but it was without appreciable effect in reducing rots caused by Diplodia, Gibberella, or Basisporium. Three years' results were reported on the effect of time of planting on the percentage of rotten and chaffy ears in yellow dent corn. Late plantings (May 31) were, in general, more severely attacked by Diplodia, Gibberella, and Fusarium, and the proportion of chaffy ears was increased, possibly through a lack of maturity in the late planted corn.

The same authors are reported to have found that seed treatment with the proper fungicides can be recommended for the control of Diplodia, Gibberella, and Fusarium rots. The gains were slight where nearly disease-free seed was used, but with infected seed considerably greater yields were obtained by treatment. The best results were secured with nitrophenol-mercury and cresol-mercury dusts used at the rate of 2 oz. per bushel of seed corn. The treatments had little effect in reducing rots due to Cephalosporium or Basisporium or on scutellum rots. Germinator tests were also found desirable in determining the value of corn for seed purposes.

[*Fruit tree disease studies*].—H. W. Anderson is reported to have found that the regular removal of diseased bark is an effective method of reducing the number of infections by the apple tree blister canker.

Apple measles is said to be developing quite rapidly in the south-central part of Illinois, serious losses being reported in some orchards.

A severe epidemic of fire blight in the summer of 1927 is said to have shown that statements regarding the resistance to fire blight of *Pyrus calleryana* and *P. ussuriensis* were misleading, although some seedlings of *P. ussuriensis* have shown great resistance. The pear variety Favorita, reported to be highly resistant, was found to be quite susceptible. Experiments are said to have shown that careful cutting out of the blight cankers will control fire blight on Willow Twig apple trees.

The control of brown rot of peaches was found practicable by the application of dusts or sprays which contained sulfur, and very little difference was noted between commercial and homemade dusts or between very fine sulfur and coarser dusts.

Laboratory experiments are being continued to find a substitute for sodium silicofluoride, which proved unsatisfactory for the control of peach bacterial spot.

A study of orchards after the floods of 1926–27 is said to have shown that collar rot is usually due to adverse conditions and not to some specific organism.

[*Bramble fruit disease control*].—Experiments by A. S. Colby are said to have shown that crown gall of raspberries was not controlled by one of the organic mercury compounds tested. Lime sulfur was found more effective than Bordeaux oil emulsion for the control of blackberry anthracnose. Stickers added to the fungicide proved unnecessary.

[*Diseases of ornamentals*].—F. F. Weinard and S. W. Decker are reported to have found considerable differences in the susceptibility of varieties of peonies to diseases. Spraying with Bordeaux mixture after blooming reduced Cladosporium leaf spot of peonies.

Treating the soil in a bed in the greenhouse with a 1 to 120 dilution of formaldehyde is said to have reduced the amount of aster wilt. Bordeaux mixture was without effect in reducing aster wilt or yellows in the garden.

[Plant disease investigations] (*Kentucky Sta. Rpt. 1927, pt. 1, pp. 15–18*).—Studies of tobacco virus diseases have been continued, and the relation between the diseases and chewing tobacco by men engaged in setting the plants in the field, and the presence of certain weeds in tobacco-growing regions is again indicated (E. S. R., 60, p. 54).

In addition to the five common types of tobacco mosaic other strains are enumerated, such as various forms of etching, vein banding, ring spot, and puff. The latter is considered to be probably identical with cucumber mosaic. There is said to be a relationship between the abundance of solanaceous weeds and the occurrence of the various types of tobacco mosaic. Only true mosaic appeared to be carried by dry tobacco.

Tests at the station are said to indicate that angular leaf spot of tobacco may be seed borne. Seed selection and the hot water treatment of the seed are suggested as means for controlling this disease. Much of the spotting attributed to *Bacterium angulatum* is considered to be due to physiological causes, such as a lack of fertilizers, etc.

A chlorosis of pin oaks due to lime causing a deficiency of iron in the plants was controlled by spraying with a 1 per cent solution of iron sulfate. Spraying with manganous sulfate failed to bring about recovery, and neither iron sulfate nor manganous sulfate added to soil affected chlorotic trees favorably.

Red clover breeding experiments are said to have resulted in new strains of self-fertile plants that are immune to mildew.

Diseases of cultivated and wild useful plants in the district of Samara in 1926 [trans. title], I. P. GILÎAROVSKIĬ (GHILIAROVSKY) (*Trudy Samarsk. Selsk. Khoz. Inst. (Works Samara Agr. Inst.), 4 (1927), pp. 351–396; Eng. abs., pp. 392–396*).—Meteorological conditions as indicated stimulated the development of fungi parasitic on or in cultivated plants, a number of which are listed, with attacking organisms, and with modes and degrees of attack.

Biochemistry of plant diseases.—IX, Pectic enzymes, F. R. DAVIDSON and J. J. WILLAMAN (*Bot. Gaz., 83 (1927), No. 4, pp. 329–361, figs. 5*).—Protopectinase (pectosinase) has been prepared from *Rhizopus tritici* and *Bacillus carotovorus*. Pectase has been prepared from clover leaf sap, corn pollen, and the mycelium of *Sclerotinia cinerea*. Pectinase has been prepared from the mycelia of *R. tritici*, *S. cinera*, and *Botrytis cinerea*, also from barley malt. Quantitative methods for measuring the activities of these enzymes have been developed and the conditions determined for their production and action. A careful search among many cultures of Sclerotinia and related forms failed to disclose protopectinase activity in any of them. The maceration rate of several tissues was measured, including that of large and small potato tubers, different regions of the tubers, carrot, squash, sweet potato, pumpkin, turnip, and apple. Convincing evidence is said to have been obtained, and is outlined, in support of the view that there exists at least three distinct pectic enzymes, namely, protopectinase, pectase, and pectinase. Oxalates of sodium, potassium, and ammonium did not macerate tisses of lemon, potato, carrot, and apple within a wide range of H-ion concentration.

The plant galls of central and northern Europe, H. Ross and H. Hedicke (*Die Pflanzengallen (Cecidien) Mittel- und Nordeuropas. Jena: Gustav Fischer, 1927, 2. ed., rev. and enl., pp. VII+348, pls. 10, figs. 33*).—This amended edition (E. S. R., 26, p. 658) has been prepared in collaboration with Hedicke. Some gall-causing fungi are included. A list of plant genera arranged according to Engler is given.

Anatomical and bacteriological studies on plant crown galls [trans. title], J. Magrou (*Ann. Inst. Pasteur, 41 (1927), No. 7, pp. 785–801, figs. 9*).—Having noted frequently the formation of supernumerary steles, both intramedullary and intracortical, following inoculation with *Bacterium tumefaciens* in such plants as *Helianthus annuus, Solanum lycopersicum, Ricinus communis,* and *Pelargonium zonale,* the author presents some details, with discussion, referring partly to the work of others named.

Smoothness and roughness and spontaneous agglutination of Bacterium citri, Bact. medicaginis var. phaseolicola, Bact. phaseoli sojense, and Bact. tumefaciens, G. K. K. Link and K. L. Hull (*Bot. Gaz., 83 (1927), No. 4, pp. 412–419, figs. 3*).—The phenomenon of roughness and smoothness of colony form is reported for *B. citri, B. medicaginis phaseolicola,* and *B. tumefaciens.* These organisms seem to be in a state of instability so far as roughness and smoothness are concerned, with *B. tumefaciens* apparently the least stable. In *B. tumefaciens* roughness in colony form seems to be correlated directly with ready spontaneous agglutination in distilled water and in 0.85 per cent NaCl solution, whereas smoothness seems to be correlated directly with less agglutinability. Mixed cultures can be separated roughly by means of this differential agglutination. These phenomena of colony form and agglutination may be qualitative and quantitative or merely quantitative.

Bordeaux mixture: Its adhesive power under Egyptian climatic conditions, R. R. Le G. Worsley (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 78 (1928), pp. 5*).—The series of experiments reported is said to have established the fact that the best proportions for a Bordeaux mixture that will adhere well in Egypt are 1:0.5:50 or 100, i. e., 1 part of copper sulfate to 0.5 part of lime to 50 or 100 parts of water. The mixture should be prepared at a temperature between 15 and 30° C., but preferably at as near 20° as possible.

Seed treatment for cereal smuts, I. L. Conners (*Canada Dept. Agr. Circ. 56 (1927), pp. 4, figs. 2*).—Losses running into millions of bushels of wheat, barley, and oats are caused every year in Canada by destruction and dockage due to smuts. The greater prevalence in oats and barley is ascribed to the fact that these receive less treatment than does wheat. Treatments found quite effective for use on seed grain include copper-carbonate dust and formalin. Copper sulfate is not as good as copper-carbonate dust or formalin for wheat nor as good as formalin for the other grains. Methods, materials, and appliances are indicated.

Corn stripe disease in Cuba not identical with sugar cane mosaic, C. F. Stahl (*Trop. Plant Research Found. [Wash., D. C.] Bul. 7 (1927), pp. 12, figs. 6*).—A summary of what was known regarding the disease called corn mosaic up to the fall of 1924 states that a disease identical with sugar cane mosaic, or very similar to that disease, had been reported from Hawaii, Guam, the United States, Porto Rico, and Trinidad. Since that time the author has studied the trouble, and as a result it is claimed that there is prevalent in Cuba a serious disease of corn which is distinct from the mosaic disease of sugar cane, though previously usually considered to be the same disease. Details of the studies are briefly given, and the name corn stripe is proposed as distinctive. Corn is severely injured by this disease. The plants are checked as to growth and remain stunted, and they usually die if attacked while young. Corn stripe is transmitted by the corn leafhopper (*Peregrinus maidis*) but not by the corn aphis (*Aphis maidis*). Though corn is susceptible to sugar cane mosaic, it is inconspicuously affected by it. Sugar cane has not thus far been successfully inoculated with corn stripe.

The pathology of the cotton plant in Nigeria, G. H. JONES (*Empire Cotton Growing Rev., 4 (1927), No. 1, pp. 36–45*).—The two general objects of the present article are to report on progress and to clarify the situation as regards cotton diseases in Nigeria. The author attempts to link up observations made as far back as 1912, to incorporate the more recent work, and to introduce some kind of order into the existing complexity by grouping diseases into classes according to relative economic importance.

Listed as of major importance are internal boll disease, bacterial disease (*Pseudomonas malvacearum*), and leaf curl (a virus); as of intermediate or of local importance are anthracnose (*Colletotrichum gossypii*), leaf roll, Alternaria disease, and crinkle (physiological); and as of minor importance are areolate mildew (*Ramularia areola*), damping-off (*Sclerotium bataticola*), rust (*Kuehneola desmium, Uredo gossypii*), *Cercospora gossypii*, and *Fusarium* sp.

Fungoid pests of cotton, T. LAYCOCK and G. H. JONES (*West African Agr. Conf., Ibadan, Nigeria, Proc., 1 (1927), pp. 146–158*).—In the first part of this account fungi responsible for loss, dealt with somewhat in the order of their economic importance, include those causing internal boll rot (*Nematospora gossypii*), anthracnose boll rot (*Glomerella gossypii*), a Fusarium boll rot (*Fusarium* sp.), and the minor rots *Diplodia gossypina* and *Cephalosporium* sp.

In the second part a résumé is given of the paper by Jones noted above.

Recent work on Ascochyta pea blight in Wisconsin, M. B. LINFORD (*Canning Trade, 49 (1926), No. 12, pp. 14, 16*).—The present account is said to be mainly a summary of a paper prepared by the author above named and R. Sprague.

Ascochyta blight (leaf and pod spot) of peas is deemed of comparatively moderate importance in Wisconsin, though certain injurious effects are here described. Recent studies are said to have shown that not all of the so-called Ascochyta injury is caused by one fungus but that two or three may be involved, and that these agents differ markedly as to the kind and severity of the effect on pea plants. One of these, the light spot fungus (*A. pisi*), is said to cause leaf and pod spot but not foot rot. The second, the dark spot fungus (*Mycosphaerella pinodes*) is described as being a more serious parasite, damaging all parts of the plant and having, apparently, caused the most serious outbreaks of Ascochyta blight reported. The third (foot rot) fungus, much like the second, sometimes causes unimportant spotting of pea leaves, stems, and pods, but is the most common cause of Ascochyta foot rot. Any of these may be carried on the seed. In tests, 54 of 94 samples of the 1925 Wisconsin-grown crop carried one or more of these Ascochytas.

"In these diseased samples an average of 8.4 per cent of the peas were diseased. . . . The experience of this year shows that diseased seed carrying any of these fungi may be planted under some conditions without any important harm resulting, but the use of clean seed is to be preferred when it is available

It seems as important to know which of the different kinds of Ascochyta is on the seed as to know that the seed is diseased at all. . . . Ascochyta blight was somewhat more prevalent in Wisconsin in 1926 than in 1925, and more than that in 1924, but in 1926 it was an almost negligible factor among pea diseases in the State. For the present, at least, root rot, wilt, and bacterial blight are more important in Wisconsin."

Species of Ascochyta parasitic on the pea, M. B. LINFORD and R. SPRAGUE (*Phytopathology, 17 (1927), No. 6, pp. 381–397, pls. 2, figs. 2*).—As a result of a study of leaf and pod spots and foot rot of peas in Wisconsin, the authors report two species and a provisional form that are parasitic and cause diseases previously attributed to *A. pisi*. A preliminary account of certain phases of this investigation is noted above.

Emended descriptions are given of *A. pisi*, of the pycnidial stage of *Mycosphaerella pinodes*, and of *M. pinodes*, microform.

Diseases of potatoes [trans. title], K. N. I͡ATSYNINA (*Trudy Opytn. Issledov. Uchast. Sta. Zashch. Rast. ot Vred. Moskov. Zemel. Otd., No. 1 (1927), pp. 139–187*).—Investigations were carried on for several years to discover the potato varieties resistant to disease, to ascertain what cultural methods and other tillage field operations could influence the susceptibility of the potato to disease, and to find measures available for the control of plant diseases. The experiments on disease resistance were conducted with the purpose of finding out the degree of susceptibility of the particular variety to disease during the vegetative period, the keeping qualities of the potatoes, and the causes of immunity of certain varieties against *Phytophthora infestans*.

Of more than 10 potato varieties investigated, not one was found to have any absolute resistance against *P. infestans*. Other diseases noted in this connection were *Alternaria solani*, *Hypochnus solani* (*Rhizoctonia solani*), and *Cercospora concors*. The latter two diseases are less abundant on loam than on sandy soils. *P. infestans* was more prevalent on sandy soils, as was also potato scab. The time of application of barnyard manure had no effect on the development of the disease, but when the manure was added in the row an increase of infection was noted. An increase in scab was noted when the manure was applied in the fall previous to the planting season. Replacing barnyard manure with mineral fertilizers had no effect on the degree of infection by *P. infestans*

No correlation was noted between tuber size and degree of infection.

Experiments conducted with Bordeaux mixture and lime-sulfur sprays showed that Bordeaux mixture is the more effective in controlling *P. infestans*. No advantage appeared from spraying twice, the first time when the disease was noted and the second time two weeks later.

The removal of the tops before digging had no effect on the percentage of infection of the tubers in storage.

A note on the production of premature sprouting in the potato, and its application to the study of virus diseases, R. N. SALAMAN (*Jour. Agr. Sci. [England], 17 (1927), No. 4, pp. 524–529*).—The author gives details of small-scale trials made during 1926–27, in the course of which an effective and very simple method was discovered which is said to give early sprouting and to allow of grafting and the production of positive results in regard to virus infections before the middle of March.

It is stated that while the chemical stimulants used (potassium thiocyanate with sodium thiocyanate, and thiourea) certainly aid in the removal of the latent period of the potato tuber, the cutting of the tuber, especially by the extreme method of making cores, leads to a rapid and early formation of young and strong sprouts. Varieties react differently toward the chemical stimulants employed. The thiourea solution causes more sprouts to arise from a single eye than does thiocyanate solution or the absence of any special treatment. Different varieties, untreated, have very different latent periods and sprout with varying degrees of speed. By means of sprout grafting during the winter months, positive results of virus disease infection may be attained early in March in a glasshouse having an average temperature of 11° C. (51.8° F.)

Transmission experiments with insects of virus diseases of the potato (Solanum tuberosum) [trans. title], D. L. Elze (*Meded. Landbouwhoogesch. Wageningen, 31 (1927), No. 2, pp. 90, pls. 2, figs. 6; Eng. abs., pp. 61–65*).—An account is given, with a bibliography of 128 titles, of a study by the author on the part played by insects in the transmission of virus dieases of *S. tuberosum*; on the biology of such insects, particularly the aphids; and, so far as possible, on the character or nature of the virus itself.

Virus diseases supposedly spread only by one special insect, as here indicated, include sugar beet curly top, aster yellows, and sugar cane and maize mosaic and streak disease. Viruses spread by different kinds of insects include spinach blight and possibly tobacco mosaic. A virus spread mechanically by various agencies is cucumber mosaic. Diseases not known to be transmitted by any particular insect include little peach, sandal spike, and Abutilon infectious chlorosis.

The apparent requirement in many cases of high specialization as prerequisite to transmission is considered to indicate that a virus is a living organism.

Several aphids, but few other insects, have been proved to carry virus. Among the aphids, *Myzus persicae* is the most numerous in the Netherlands. A second, *M. pseudosolani*, is known only as regards the asexual forms, but it is thought to overwinter in open air in the Netherlands. Less numerous is *Macrosiphum solanifolii*, the asexual forms of which are not known to exist in the Netherlands. *Aphis rhamni* is thought to be identical with *A. abbreviata*. Of other Hemiptera, the most numerous are the jassids *Eupteryx auratus* and *Typhlocyba solani* (*Chlorita flavescens* or *C. viridula*), and the plant bug *Lygus pratensis*. Among the remaining insects, only the potato flea beetle *Psylliodes affinis* is important.

With some of these experimentation was carried out, and it was found that each insect was able to transmit one or more diseases, though aucuba mosaic was not transmitted. In the case of aphids the developmental stage has no decisive influence. Other insects were more difficult to use successfully as regards transmission. Leaf roll was the easiest disease to transmit.

As regards the specific relation between insect and virus, an incubation period of from 24 to 48 hours appears to exist between *Myzus persicae* and leaf roll.

Aphids which after leaving the diseased potato plant had lived for 7 or 10 days on an unsusceptible plant (spinach) and then on healthy plants caused infection of the latter in two cases. Apparently, virus from the mother insects can not be transmitted to their offspring. The virus is not lost when the insect sheds its skin. The virus was transmitted downward from infected potato tops, reaching the tubers in about 4 weeks. Apparently, insects which increase in late summer are of less importance, if any, as regards infection.

Bacterial pocket disease of the sugar beet, N. A. Brown (*Jour. Agr. Research* [*U. S.*], *37 (1928), No. 3, pp. 155–168, pl. 1, figs. 4*).—In 1911, in connection with a report on crown gall, Smith et al. described, under the name tuberculosis, a disease of sugar beets (E. S. R., 25, p. 243). The author of the present paper states that the disease was not reported from 1912 until it appeared in 1923 on sugar beets at the Arlington Experiment Farm near Washington, D. C. Following this appearance a detailed study was made of the disease, which the author prefers to call bacterial pocket disease from the characteristic pocketlike cavities occurring in the overgrowths.

The organism is said to be a wound parasite, which probably gets into the sugar beet through cultivation wounds or through breaks in the rootlets when the beets are thinned. The disease was found to occur in fields that were heavily manured or in those that had received large quantities of sodium or potassium nitrate. It is said to be produced by the organism *Bacterium beticola*, which stimulates the tubercles to form on the beet, discolors the gall tissues, and produces cavities which usually contain a viscid fluid. The disease was reproduced on sugar beets and garden beets by inoculation.

An emended description of the organism is given.

Investigations into diseases of cane, E. J. F. Wood (*Queensland Bur. Sugar Expt. Stas. Ann. Rpt., 27 (1926–27), pp. 27–33*).—The results of an inspection are outlined, largely in tabular form, for the various districts covered, with other information, and suggestions are given regarding the control of plant diseases, including sugar cane mosaic, leaf stripe, leaf scald, gumming, red rot, top rot, spindle top, and minor diseases.

Field control of sugar cane root disease conditions, J. A. Faris (*Trop. Plant Research Found. [Wash., D. C.] Bul. 6 (1927), pp. 16, fig. 1*).—The chief pathologist indicates that the enviromental factors have proved to be by far the most important in the production of the root diseases in the cane fields of Cuba, in that the plants are weakened by various unfavorable conditions and due to reduced vigor the fungi are able to attack the plants. Though on a first examination it appears that the trouble is due primarily to disease organisms, two years' experimentation with cane in pots and in fields has failed to show active primary parasitism by any of the fungi isolated in pure cultures from diseased cane or in case of chopped diseased roots spread over seed pieces of cane at planting time. Zonate foot rot, however, is regarded as an exception to this, as it is found over extensive areas where the conditions are otherwise favorable to the growth of the cane.

The net results of the experiments to date indicate that if this primary weakening of the plants by environmental causes could be avoided, the associated fungi could not cause the roots to rot.

Considerations presented deal with the most important phases of the primary weakening of the plants, which results in the failure of cane usually attributed to root disease.

It is regarded as clear that the prevention of the primary weakening of the plants would avoid the invasion of the secondary fungi. The logical procedure, therefore, for practical field control of these root diseases is to concentrate upon the possible preventive measures. This requires a careful analysis of the situation in the field when the cane shows the symptoms of root disease, in order to determine the underlying causes of the trouble. The author attempts to point out what are considered to be the main contributing causes to the weakening of the cane and also such corrective measures as experiments have demonstrated to be practicable under field conditions.

Soil conditions dealt with include water-logging, lack of moisture, deleterious substances in the soil solution, lack of fertility, weeds and grasses, and other limitations to root growth and development.

Hosts and symptoms of ring spot, a virus disease of plants, S. A. Wingard (*Jour. Agr. Research [U. S.], 37 (1928), No. 3, pp. 127–153, figs. 23*).—In a previous publication (E. S. R., 59, p. 850) a preliminary account was given by Fromme et al. of an infectious disease of tobacco of a virus type. In the present paper a further study is reported on the occurrence and symptoms of the disease on other hosts than tobacco, and on the various species and varieties of Nicotiana.

Inoculation experiments of 72 genera of plants showed that 38 of the genera, representing 17 families of plants, developed infection. The first symptoms are said to appear in about 3 days after inoculation, and infection becomes systemic about 10 days later. The symptoms of the disease are restricted to the leaves of the majority of the plants, but they may also appear on the stems and fruits of some hosts.

Several species of Nicotiana, Broad Windsor bean, Blackeye cowpea, kidney bean, Lima bean, snapdragon, and New Zealand spinach were killed outright as a result of ring-spot infection. Infection was found to occur naturally on sweet clover and on the commercial varieties of tobacco, and tobacco was successfully infected with virus from 21 different host plants.

Brown-rot diseases of fruit trees in 1926, H. Wormald (*Gard. Chron., 3. ser., 82* (*1927*), *No. 2125, p. 232, figs. 2*).—Brown-rot diseases of fruit trees due to *Sclerotinia cinerea* and *S. fructigena* were unusually prevalent in England during 1926. Particulars are given.

Crown gall of fruit trees and small fruits, G. H. Berkeley (*Canada Dept. Agr. Circ. 58* (*1927*), *pp. 2, fig. 1*).—A brief account is given regarding the nature, distribution, severity, importance, symptoms, causation, and control of crown gall (*Bacterium tumefaciens*). Avoidance of crown gall infected or injured plants and of soil infested with crown gall bacteria is deemed imperative.

Economic significance of cacao pod diseases and factors determining their incidence and control, H. A. Dade (*Gold Coast Dept. Agr. Bul. 6* (*1927*), *pp. 59, pls. 8*).—The work here outlined is regarded as preliminary in an investigation, the object of this being the acquisition of definite information regarding the conditions obtaining in the native cultivation of cacao in the Gold Coast. An analysis has been made of the factors determining the degree of disease incidence and the conditions both environmental and meteorological. The economic practicability of modern methods of artificial control of diseases has been investigated. The results obtained suggest a wide field for future investigations.

Among conditions determining the severity of infection in the case of black pod disease, atmospheric humidity appears to be the key factor. Other important factors, some of these more or less independent of a sustained high humidity, are due to morphological characters of the host. In farms having well-balanced conditions of water relation pod injury due to insects and other agents is not very important as a factor in extending the disease. This appears also to be true of the accumulation of husks. Diseased cushions favor incidence of black pod, and these also probably help largely to carry over the infection. Reduction of humidity favors disease control. It is thought that elimination of some of the morphological factors favoring infection may be possible. Reduction of disease incidence to a negligible degree may be practicable by the use of the means indicated.

Of parasitic fungi causing pod diseases only one (*Phytophthora faberi*) is regarded as of considerable importance, though *Colletotrichum* sp. (*C. cradwickii?*) is more important than was formerly thought. Other fungi are negligible as pathogenes.

Control of disease by dusting is not at present practical.

Diseases of cocoa and measures for their control, R. H. Bunting (*West African Agr. Conf., Ibadan, Nigeria, Proc., 1* (*1927*), *pp. 86-97*).—This is a systematic account, with discussion, of Gold Coast cacao diseases indicated in connection with causal agents, and of control policies and measures, including legislation.

Vegetable parasites of the tea plant.—The blights, A. C. Tunstall (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1927, No. 3, pp. 73–86*).—In this, said to be the first of a series of articles on tea plant diseases, the author deals without strictly scientific descriptions with *Loranthus* sp., ferns, lichens and mosses, leaf and stem gray blight (*Pestalozzia theae*), leaf and green stem brown blight (*Glomerella cingulata, Colletotrichum camelliae*), and leaf rim blight (associated with *Alternaria* sp. and *Cladosporium* sp.).

Morphology and taxonomy of the pecan-scab fungus, Cladosporium effusum (Wint.) comb. nov., J. B. Demaree (*Jour. Agr. Research [U. S.], 37 (1928), No. 3, pp. 181–187, pl. 1, figs. 2*).—As a result of his studies, the author claims that the pecan-scab fungus usually referred to as *Fusicladium effusum*, should be called *C. effusum*. An emended description is given of the organism.

A Pestalozzia disease of walnut trees [trans. title], E. Gäumann (*Mitt. Schweiz. Centralanst. Forstl. Versuchsw., 14 (1927), No. 2, pp. 195–200, figs. 3*).—The cause of this disease of walnut trees, occurring in Zurich, is considered to be *P. funerea*, which is said to have been described by Doyer (E. S. R., 57, p. 541).

The European elm disease (*Bartlett Research Labs. Bul. 1 (1928), pp. 35, figs. 8*).—This collection, containing what is considered the more important available recent information regarding the European elm disease, includes, besides an introduction by F. A. Bartlett, papers said to have been assembled under the direction of R. P. Marshall as contributed by different authors, some accounts regarding which have been noted. These papers comprise The Twig Wilt and the Vascular Disease of the Elm, by M. B. Schwarz, trans. by L. D. Kelsey (pp. 5–25); Elm Blight and Its Cause, *Graphium ulmi* Schwarz, by H. W. Wollenweber, trans. by L. D. Kelsey (pp. 26–31) (E. S. R., 59, p. 647); The Dutch Elm Disease, by M. Wilson (pp. 32, 33), noted below; and The Occurrence of the Dutch Elm Disease in England, by M. and M. J. F. Wilson (pp. 34, 35).

The Dutch elm disease, M. Wilson (*Gard. Chron., 3. ser., 81 (1927), No. 2095, pp. 133, 134, fig. 1*).—The appearance during recent years of a serious disease of elm in northwest Europe has led to the issuance of an order prohibiting the importation of elms from continental Europe. This disease is said to have been first observed at Tilburg in North Brabant, Netherlands, in September, 1919, and to have spread persistently all over that country. It was recorded as general in Belgium in 1921, and in the same year in France, north of the Seine. In 1924, it was found in Germany (Rhineland, Westphalia, Bremen, Nuremberg, Potsdam, and Bonn), and at Aix-la-Chapelle in 1925 In 1926, elms showing the same symptoms were observed in Oslo and in localities of eastern Norway.

The injury done in the Netherlands is discussed. In the nursery, trees aged four years and over are attacked. Almost all species of Ulmus are thought to be susceptible. The disease has been found on *U. campestris latifolia, U. campestris suberosa, U. monumentalis, U. hollandica, U. nitens rupelli, U. americana*, and *U. montana*, though *U. vegeta* is said not to be attacked in the Netherlands.

The causal agent has not been determined. *Graphium ulmi* has been obtained from diseased branches along with other organisms, but infection experiments have thus far given negative results.

A wilt disease of the carnation, W. Corbett (*Gard. Chron., 3. ser., 81 (1927), No. 2096, p. 150*).—In 1926 young carnation plants received at the

Cheshunt Research Station were attacked by a disease for which no record of previous occurrence could be found. This disease is described. Of two fungi isolated from browned basal areas, one was proved to be pathogenic and was always successfully inoculated into the stems of healthy carnation plants and reisolated. The fungus, supposedly an Alternaria, has not yet been fully identified. In experiments, the optimum temperature appears to lie between 73 and 77° F., though the fungus grows well at 68°.

Experiments on the control of a narcissus root-rot, H. H. Wedgworth (*Mississippi Sta. Circ. 79 (1928), pp. 4, figs. 2*).—Experiments for the control of narcissus root rot caused by a Fusarium are said to have shown that the disease may be carried on the bulbs. Thorough disinfection of the bulbs by a 6-hour treatment with solutions of chlorophenol mercury or a 1–1,000 solution of corrosive sublimate for 1 hour proved effective in controlling the disease.

Some observations on violet root rot, A. C. Tunstall (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1927, No. 2, pp. 69–71*).—Violet root rot due to *Sphaerostilbe repens* is described as weakening and finally killing tea bushes. The fungus is discussed as attacking the roots of tea plants and of many jungle trees, with a summary of advisable preventive measures.

Defoliation of the Douglas fir, M. Wilson (*Gard. Chron., 3. ser., 81 (1927), No. 2106, pp. 323, 324*).—Douglas fir, formerly remarkably free from leaf diseases in England, has recently been attacked by *Rhabdocline pseudotsugae*, introduced from North America. The history of this disease is outlined, with an account of its effects on Douglas fir.

Mildew in east Java [trans. title], G. A. Reydon (*Arch. Rubbercult. Nederland. Indië, 11 (1927), No. 10, pp. 435–464, figs. 4; Eng. abs., pp. 461–464*).—Results as presented of the 1927 inquiry regarding Hevea mildew confirm a heavy increase of the trouble during recent years. The disease now occurs in almost all parts of east Java, affecting severely 48 per cent of the rubber estates and lowering appreciably the rubber yield. Mildew is considerably worse on low-lying than on high-lying estates and more severe on the southern than on the eastern slopes of the hills.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Measures of insect cold hardiness, N. M. Payne (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 52 (1927), No. 6, pp. 449–457, figs. 7*).—The author finds that cold hardiness to the intensity factor of low temperature can be measured by moisture content, undercooling point, and blood conductivity. Up to the time when a given insect can survive freezing, undercooling is a reliable measure of cold hardiness. Beyond the point when an insect can survive freezing, undercooling measures but a part of the total cold resistance of a given insect. Conductivity measurements are found proportional to cold hardiness throughout the whole year. In some insects there is insufficient free body fluid in winter on which to determine blood conductivity. For each species there is a different set of physical constants which measure the cold hardiness of that species.

Is the insect metamorphosis influenced by thyroid feeding? S. Kopeć (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 50 (1926), No. 4, pp. 339–354*).—The author found that the administration of thyroid to gipsy moth caterpillars did not cause any distinct changes in the duration of the larval or of the pupal period. The only effect was a distinct diminution of the weight of the chrysalids. A bibliography of 29 titles is included.

Observations on the causes of night activity in some insects, H. Necheles (*Chinese Jour. Physiol., 1 (1927), No. 2, pp. 143–156*).—In the investigations conducted with the cockchafer *Melolontha vulgaris*, the cockroaches *Periplaneta* *americana* and *P. orientalis*, and the mosquito *Anopheles maculipennis*, it was found that neither full sunlight nor light of different wave lengths exert any direct influence on their activity. Neither sunlight nor arc light produces in air any gas which exerts a depressing influence on *M. vulgaris* and *P. orientalis*, and nitrous oxide has no effect. The only factor which has any appreciable influence on the activity of all three insects is the air humidity (as influenced by temperature) and its effect on the rate of water loss by the insects. The hiding of insects during daytime is thus attributed to the necessity of seeking refuge from the excessive evaporating power (low humidity and high temperature) of day air, and their activity at night to the reversal of the air conditions, the night air being cooler and more humid.

Studies on toxicity of sodium fluosilicate, S. Marcovitch (*Jour. Pharmacol. and Expt. Ther., 34 (1928), No. 2, pp. 179–186, fig. 1*).—The author finds in work at the Tennessee Experiment Station that for insects and lower organisms such as worms and protozoa sodium fluosilicate is more toxic than sodium arsenite, while to man and the higher animals the arsenicals are at least 9 times more toxic than sodium fluosilicate and 30 times more toxic than sodium fluoride.

Entomological report, E. R. Speyer (*Expt. and Research Sta., Cheshunt, Herts, Ann. Rpt., 13 (1927), pp. 60–80*).—Accounts are here given of red spider investigations (pp. 60–75), including experiments on commercial nurseries by O. Orchard (pp. 62–68) and on fumigation by W. H. Read (pp. 69–75); a white fly parasite, *Encarsia formosa* Gahan (pp. 75–77); the chrysanthemum gall midge (pp. 77, 78); pests of young cucumber plants (pp. 78, 79); the vine tortrix, *Tortrix podana* Scop. (pp. 79, 80); and the greenhouse leafhopper, *Erythroneura parvula* Boh. (p. 80).

The blood feeding habits of Anopheles pseudopunctipennis in northern Argentina, N. C. Davis and R. C. Shannon (*Amer. Jour. Trop. Med., 8 (1928), No. 5, pp. 443–447*).—The examination of ingested blood by the precipitin reaction has shown that *A. pseudopunctipennis* captured in the houses of two localities in the Province of Tucumán, Argentina, had fed on various hosts in the following proportions: Man 50 per cent, dog 21.8, horse 8.9, sheep or goat 6.2, cow 5.5, chicken 3.2, hog 2.5, and cat 1.8 per cent. Man and dog being essentially house-dwellers at night, the results demonstrate a very high domesticity for the insect.

Breeding places of Anopheles pseudopunctipennis in the Province of Tucumán during the dry season [trans. title], R. C. Shannon and N. C. Davis (*Rev. Inst. Bact.* [*Argentina*], *4 (1927), No. 7, pp. 663–678, figs. 5; Fr., Eng., Ger. abs., pp. 677, 678*).—It has been found that *A. pseudopunctipennis*, the principal carrier of malaria in Argentina, breeds continuously throughout the year, maintaining itself during the unfavorable dry and winter season by continuous breeding in the gorges and ravines, where the mountain streams and springs furnish a sufficient supply of fresh water.

The relation of certain algae to breeding places of mosquitoes in Queensland, R. Hamlyn-Harris (*Bul. Ent. Research, 18 (1928), No. 4, pp. 377–389*).—Observations and experiments over a period of 18 months are said to have confirmed the findings of previous authors that Characeae do not in themselves possess larvicidal properties. "That food is the main determining factor in the choice of preferential breeding places seems to be borne out by actual results obtained, and when such are not available mosquitoes will resort to breeding places of compulsion, such places being usually observed to be entirely or partly devoid of food supplies. It is suggested that the salts of alumina and iron in the ferrous state tend to destroy food organisms, and that where these conditions exist, the water is not selected preferentially. The presence of algae leads to the appearance of *Anopheles annulipes.* That *Cladophora holsatica* inhibits larval growth seems to be experimentally established. Bacterial scums are mainly due to *B[acillus] subtilis* and have a tendency to produce a slight alkalinity."

An experimental study on twenty-four species of Japanese mosquitoes regarding their suitability as intermediate hosts for Filaria bancrofti Cobbold, S. YAMADA (*Tokyo Imp. Univ., Govt. Inst. Infect. Diseases Sci. Rpts., 6 (1927), pp. 559–622, pls. 3*).—Seven of the 24 species studied have been ascertained to be suitable for the development of Filaria, each of which is frequently found in human habitations.

The blood-sucking nematocerous Diptera: Chironomidae, Ceratopogoninae, J. J. KIEFFER (*Faune de France. Vol. 11, Diptères (Nématocères Piqueurs): Chironomidae Ceratopogoninae. Paris: Féd. Franç. Soc. Sci. Nat., Off. Cent. de Faunistique, 1925, pp.* [3]+*139, figs. 83*).—A synopsis of this group of blood-sucking Diptera, with a bibliography of four pages.

Observations on the thermal death points of the blow-fly at different relative humidities, M. V. F. BEATTIE (*Bul. Ent. Research, 18 (1928), No. 4, pp. 397–403, figs. 2*).—The author has found the thermal death point of the blowfly to be definitely influenced by humidity, saturated and dry air having the effect of lowering the thermal death point. Relative humidities from 60 to 80 per cent were more favorable, while relative humidity of 70 per cent actually was found to be an optimum point. From the weighings made it was concluded that death in saturated air was due to the inability of flies to regulate their heat by evaporation.

Notes on the process of digestion in tsetse-flies, H. M. O. LESTER and L. LLOYD (*Bul. Ent. Research, 19 (1928), No. 1, pp. 39–60, figs. 13*).—This subject is presented under the headings of introduction, anatomy of the alimentary tract, method of feeding, enzymes influencing the coagulation of blood, and functions of the organs of alimentation and excretion.

Observations upon Lixophaga diatraeae Townsend, a tachinid parasite of Diatraea saccharalis Fabr. in Porto Rico, H. E. BOX (*Bul. Ent. Research, 19 (1928), No. 1, pp. 1–6, fig. 1*).—This is an account of the bionomics, natural enemies, economic importance, and introduction into other countries of a tachinid parasite of the sugar cane borer. It is an important enemy of the pest in Porto Rico, where it was under the author's observation from February, 1925, until early in 1927.

The beetles of the genus Phyllophaga inhabiting South Carolina, P. LUGINBILL (*Ann. Ent. Soc. Amer., 21 (1928), No. 1, pp. 47–91, figs. 36*).—Thirty-one species of May beetles recognized as occurring in South Carolina are here described, two of which are new to science.

The May beetle: Studies of its biology and occurrence in south central Europe [trans. title], F. ZWEIGELT (*Monog. Angew. Ent. No. 9 (1928), pp. XII+453, pls. 12, figs. 7; abs. in Rev. Appl. Ent., 16 (1928), Ser. A, No. 5, p. 235*).—This is a report of studies of the cockchafer, *Melolontha melolontha* and *M. hippocastani*, extending over a period of 15 years and presented in connection with an 8-page list of references to the literature. The special part (pp. 1–349) deals particularly with records of the occurrence of the pest and factors influencing the same, and the general part (pp. 350–445) with its economic importance, biology, natural enemies, and control.

Aphids attended by ants in Pennsylvania, T. L. GUYTON (*Penn. Acad. Sci. Proc., 1 (1924–1926), pp. 102–104*).—A list is given of aphids attended by ants in Pennsylvania, followed by a list of the ants attending aphids in the State.

The biology of Tapinoma sessile Say, an important house-infesting ant, M R. Smith (*Ann. Ent. Soc. Amer., 21 (1928), No. 2, pp. 307–330, figs. 4*).—This is an account of a native North American ant which is of considerable economic importance as a house pest not only in Urbana, Ill., but in localities in California, Nevada, District of Columbia, Maryland, Tennessee, and Mississippi. The natural food of the ants is honeydew, supplemented by the flesh of organisms. In houses they feed on fruits, vegetables, meats, and sweets, but seem to show a preference for sweets. A list is given of species of plant lice, scale insects, mealybugs, tree hopper, etc., which this ant is known to attend.

The green tree-ants of tropical Australia, F. P. Dodd (*Victorian Nat., 45 (1928), No. 5, pp. 124–131, pl. 1*).—An account of the habits of the pale-green arboreal ant of tropical Queensland and northern Australia, *Oecophylla virescens*.

Dysdercus sidae Montr. in Queensland, E. Ballard and M. G. Evans (*Bul. Ent. Research, 18 (1928), No. 4, pp. 405–432, pls. 3, figs. 7*).—An account of the life history of and control measures for this serious pest of cotton in Queensland.

Insect prediction hazards with particular reference to the leaf-hopper, Empoa pomaria McA., J. R. Stear (*Penn. Acad. Sci. Proc., 2 (1927–1928), pp. 54–58*).—The author points out that there are four factors to be considered in an insect prediction: (1) The number of insects or insect stages present at the time of the prediction; (2) the reproductive capacity of the insect, including the number of generations in a season and the number of individuals per generation; (3) the weather, particularly temperature and rainfall; and (4) natural enemies.

His study of *E. pomaria* has led to the conclusion that the possibility of injury by this leafhopper can be quite accurately determined.

Notes on the injury to plant cells by chinch bug feeding, R. H. Painter (*Ann. Ent. Soc. Amer., 21 (1928), No. 2, pp. 232–242, figs. 6*).—This is a contribution from the Kansas Experiment Station, which reports having obtained evidence that the dissolving action probably of the salivary fluid plays an important part in enabling the chinch bug to puncture the plant cells.

Some life habits of Aphis rubiphila Patch, F. F. Smith (*Penn. Acad. Sci. Proc., 1 (1924–1926), pp. 83, 84*).—An account of observations on the life history and habits of this aphid, the shining black eggs of which are laid on raspberry canes in the axils of the buds, in crevices of the bark, or in anthracnose sori. The young nymphs crawl to the buds and work their way down among the leaves. Their young settle down near the stem mothers. A few winged individuals appears in the second generation, more in the third, and a large number in the fourth.

The activities of certain predators, as *Hippodamia convergens* and the two-spotted lady beetle, and a small hymenopterous parasite, *Aphidius* sp., generally reduce the apterous individuals in the colonies so greatly that but few are present at the time of dispersal.

Coccidae of Formosa, R. Takahashi (*Philippine Jour. Sci., 36 (1928), No. 3, pp. 327–349, pl. 1*).—The author records 50 species and 2 varieties of the nondiaspine Coccidae as occurring in Taiwan (Formosa), of which 5 species and 1 variety are described as new to science. The genus Mizococcus is erected.

The application of sodium fluosilicate by airplane in an attempt to control the sugar-cane moth borer, T. E. Holloway, W. E. Haley, and J. W. Ingram (*U. S. Dept. Agr. Circ. 45 (1928), pp. 8*).—This is a report upon the airplane dusting in 1927 of 5,000 acres of sugar cane extending along a stretch of some 200 miles from above New Roads to Lockport and thence to Lafayette, La. The cane was dusted three times at monthly intervals beginning August 1, about 16 lbs. of sodium fluosilicate dust being used per acre at each application. Two brands of dust were used, one being "the most promising American kind and the other a highly recommended imported brand."

The effect of the dust was determined by carefully cutting open sugar cane stalks and counting the dead and living borers. Examinations were made in the period extending from the fourth to the fifteenth day after dusting. More than two-thirds of the dead larvae were found in the interval from the fifth to the eighth day, inclusive. In all, 7,382 stalks were examined, and 7,574 borers were found in all the larval stages and in the pupal stage. The results of the examinations are reported in detail in tabular form. An apparent death rate for all stages of 28.2 per cent of borers was observed, mostly among small ones. This was partly offset by the natural mortality of 8.6 per cent. The mortality in the small larvae outside the stalk was 61 per cent, of which 35.6 was due to the insecticide.

Thirteen experiments conducted at various places failed to indicate control, this being accounted for by the low percentage of kill and the high rate of reproduction of the moth borer. The application of the sodium fluosilicate was followed in some cases by burning and resulted in estimates of loss of from 1 to 2.5 tons per acre. The cost of the materials and the application by airplane was about $7.80 per acre.

Codling moth control (*Kentucky Sta. Rpt. 1927, pt. 1, p. 30*).—The increase in the damage caused by the codling moth during the past several years despite careful spraying led to a series of tests at Henderson. Arsenate of lead gave satisfactory control (1) when at least 3 lbs. were used per 100 gal. of spray (5 lbs. gave only slightly better control); (2) when the application was practically doubled in gallons per tree, that is, 8 to 10 gal. instead of 4 to 5 gal. per tree, as commonly applied; (3) when the spray began with the calyx application and extended to July 26 (omission of the last spray increased the injury, and omission of the calyx application gave very poor control); and (4) when the general sanitary measures were carefully carried out as a supplement to spraying.

The use of summer oils proved unsatisfactory both from the standpoint of worm control and their effect on the finish of the fruit. The addition of calcium caseinate as a sticker showed no beneficial results. Sprays applied at more frequent intervals than commonly recommended did not give material advantage in worm control.

Host selection in Pyrausta nubilalis Hübn., W. R. THOMPSON and H. L. PARKER (*Bul. Ent. Research, 18 (1928), No. 4, pp. 359–364*).—This is a report of experiments conducted at Hyères, France, in the summer of 1927 on the host selection of the European corn borer. The results of two experiments are summarized as follows:

"Of the egg masses deposited by the moths of *P. nubilalis* from Artemisia, 38.8 per cent were deposited upon this host plant and 61.2 per cent elsewhere, while of the egg masses deposited by the *P. nubilalis* females from maize, 69.6 per cent were deposited upon maize and 30.4 per cent elsewhere. The females from Artemisia deposited 58.4 per cent of their egg masses upon maize during the whole period of the experiment, but only 46.3 per cent on this plant during the period when maize and Artemisia were kept at the same height. Thus, in spite of the long association with this plant, which may indeed be the original host of the species, the *P. nubilalis* from Artemisia exhibited no striking preference for this food plant, but deposited the majority of their eggs on maize, exhibiting only a slight and hardly significant preference for Artemisia even when conditions in the experiment were distinctly favorable to this host.

"The two experiments taken together indicate clearly that of the two plants employed maize is the favored host of both the Artemisia and maize strains of *P. nubilalis.*"

The systematic study on the Formosan Pyralidae, J. Shibuya (*Jour. Faculty Agr., Hokkaido Imp. Univ., 22 (1928), No. 1, pp. 300, pls. 9*).—Four hundred and forty-two forms of Formosan Pyralidae are recognized.

The types of Hymenoptera in the Academy of Natural Sciences of Philadelphia other than those of Ezra T. Cresson, E. T. Cresson (*Mem. Amer. Ent. Soc., No. 5 (1928), pp. 90*).—The type species of Hymenoptera here listed are arranged alphabetically, by families. This is followed by a list of the type species arranged by describers, 29 in number.

The natural grouping of the Bremidae (Bombidae), with special reference to biological characters, O. E. Plath (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 52 (1927), No. 5, pp. 394–410, figs. 6*).—The author finds that biological characters are of considerable importance in determining the relationships between the various species of bumblebees, while structural characters frequently make it possible to draw inferences as to the habits of these insects. The North American Marsipoea, at least *Bremus americanorum* and *B. fervidus*, feed only their worker brood through pockets, while those larvae which are destined to become queens and males are fed by regurgitation. The use of the terms "pollen primers," "carder bees," and "long-faced bumblebees" is impracticable in any comprehensive classification of the Bremidae. Von Buttel-Reepen's explanation of the pollen-priming habit of bumblebees is not substantiated by the biology of some of the North American species.

Controlled mating in honeybees, L. R. Watson (*Quart. Rev. Biol., 3 (1928), No. 3 pp. 377–390, figs. 6*).—This further account of the author's work (E. S. R., 58, p. 165) is presented in connection with a list of 99 references to the literature.

A revision of the Indo-Australian species of the genus Apanteles (Hym. Bracon.), Part I, D. S. Wilkinson (*Bul. Ent. Research, 19 (1928), No. 1, pp. 79–105, figs. 2*).—Thirty-eight species of parasites of this genus are recognized, of which 16 and 1 variety are described as new.

Natural enemies of Sirex cyaneus Fabr. in England and their life history, R. N. Chrystal and J. G. Myers (*Bul. Ent. Research, 19 (1928), No. 1, pp. 67–77, pl. 1*).—This is an account of *Rhyssa persuasoria* L. and *Ibalia leucospoides* Hochenw., both parasitic on the wood wasp *S. cyaneus* in England. The life cycle of *R. persuasoria* is passed in one year, while that of *I. leucospoides* requires at least two years.

A method for the rearing of egg parasites of the sugar-cane moth-borers, L. D. Cleare (*Bul. Ent. Research, 19 (1928), No. 1, pp. 31–38, pls. 2, figs. 3*).—The author describes a method and apparatus that he has devised for the rearing of the egg parasites (*Trichogramma minutum* Riley and *Prophanurus alecto* Cwfd.) of the sugar cane moth borers (*Diatraea* spp.) in British Guiana.

The introduction of braconid parasites of Diatraea saccharalis Fabr. into certain of the West Indian islands, H. E. Box (*Bul. Ent. Research, 18 (1928), No. 4, pp. 365–370, pl. 1, figs. 2*).—This is an account of work conducted by the author while in Porto Rico.

On three braconid parasites of the gelechiid moth, Platyedra erebodoxa Meyr., D. S. Wilkinson (*Bul. Ent. Research, 18 (1928), No. 4, pp. 391–395, figs. 2*).—Three braconid parasites of the gelechiid moth in Uganda are here described, of which two are new to science.

Control of destructive mite aim of new test (*Illinois Sta. Rpt. 1928, p. 300*).—In control work with the cyclamen mite, which annually ruins thousands of dollars' worth of plants grown under glass in Illinois, including snapdragons, chrysanthemums, fuchsias, geraniums, and begonias, seventeen different treatments were experimented with by F. F. Weinard, A. E. Miller, and C. C. Compton. The five materials found to give the best results included Volck and two other white oil emulsions, sulfur-napthalene dust, and pure napthalene, applied at intervals of 10 to 14 days except during July, August, and early September, when spraying at intervals of 3 weeks will be sufficient.

ANIMAL PRODUCTION

Commercial feeds and their use in Kentucky in 1927, J. D. TURNER, H. D. SPEARS, W. G. TERRELL, and L. V. AMBURGEY (*Kentucky Sta. Bul. 284* (*1928*), *pp. 43–109, figs. 4*).—A summary of the official analyses of feeding stuffs for 1927, giving the manufacturer's name, kind of feed, and number of samples equal to or below their guaranty (E. S. R., 57, p. 863).

Inspection of feeds, J. B. SMITH and J. E. BLANEY (*Rhode Island Sta. Ann. Feed Circ., 1928, pp. 8*).—A summary of the guaranteed and found analyses for protein and fat of 141 samples of feed collected for inspection in 1927 (E. S. R., 57, p. 458).

Study influence of many factors on meat quality (*Illinois Sta. Rpt. 1928, pp. 92–105, figs. 5*).—Continuing this study (E. S. R., 58, p. 355), S. Bull and F. C. Olson slaughtered 2 representative heifer and 2 steer calves at the beginning of the experiment. Five heifers and 3 steers were killed after 140 days of feeding, and 5 heifers and 4 steers after 200 days of feeding. The carcasses of 3 steers from each of shelled corn and ear corn silage fed lots were compared after 266 days of feeding.

No significant differences were found in the dressing percentages of steers and heifers at any time. The shelled corn fed steers dressed 1.7 per cent higher after 266 days than the ear corn silage fed steers. In all cases the longer the feeding period the higher was the dressing percentage regardless of sex. In general the heifers had more killing fat than the steers, and this difference was greater at the beginning than at the end of the feeding period. The flanks of heifers were relatively heavier than those of the steers, while the plates showed no difference due to sex.

The flank, brisket, and navel in the order named were the fattest cuts, containing a higher percentage of fat than the carcass as a whole. The short loin and ribs contained about the same percentage of fat, while the other cuts had less fat than the carcass. Up to 140 days of feeding all cuts increased in amount of fat, but after this time there was only a slight increase in the percentage separable with a knife. Based on the composition of the wholesale ribs, carcasses of heifers slaughtered at the beginning contained twice as much fat as those of steers. After 140 days of feeding only 18 per cent more fat was found in the heifer ribs, and after 200 days only 8 per cent. The ribs of steers fed shelled corn contained 9 per cent more fat than those fed ear corn silage. No difference in the firmness of fat as determined by the refractive index was found due to sex. In cooking tests the average percentage evaporation decreased and the percentage of drippings increased with both sexes as the animals became fatter. In palatability tests the average score of all heifer ribs was 53.7 and of steer ribs 52.8. No difference in palatability was noticed for the shelled corn and ear corn silage fed steers.

Chemical analyses by H. H. Mitchell and T. S. Hamilton indicated that up to 800 or 900 lbs. in weight heifers put on fat more readily than steers, and this fat is deposited in the adipose tissue entirely.

Mitchell, Hamilton, and W. T. Haines found no significant difference in the collagen content of rib cuts of steer and heifer calves. With age the collagen content of the sirloin and especially of the chuck ribs increased, but with other cuts no distinct difference was noticed.

A study of the extractive dry matter and extractive nitrogen content of lean cuts showed nothing that would indicate any difference in the taste of meat from steer and heifer calves. The nitrogen content of extractive dry matter seemed to decrease with age. The navel was lowest in extractive dry matter, and the chuck ribs were also generally low. This portion of the work indicates that differences in flavor may depend more upon differences in the occurrence of individual extractives than in the total extractive material present.

Changes in body measurements of steers during intensive fattening, J. L. Lush (*Texas Sta. Bul. 385 (1928), pp. 59, figs. 3*).—This study (E. S. R., 58, p. 63) has been enlarged to include 185 steers divided among 19 different lots. The measurements taken on all steers show the following percentage increase or decrease relative to live weight during fattening: Chest width 9.29, loin width 5.18, chest girth 1.55, flank girth 0.97, paunch girth —0.35, depth of chest —1.95, length of body —3.53, and height over withers —5.68. The only bone measurements that approximately kept up with increase in live weight were the pelvic measurements.

The only measurements in which there was any evidence of breed difference in the way body conformation changed with fattening was in the flank and paunch girth, and even here the significance was small. Age differences were particularly noticeable in the pelvic measurements, which approached mature dimensions slowly. Of the measurements that increased rapidly with fattening, chest girth was the most useful single measurement, while height at withers or over hips was the most useful of the measurements that increased less rapidly. The ratio of chest girth to height of withers was the most useful of the ratios studied.

In summing up this study, it is believed that body measurements should be considered as of minor importance compared with weight changes and that linear measurements should be used as supplementary to other means of description.

[Investigations with beef cattle at the Illinois Station] (*Illinois Sta. Rpt 1928, pp. 88–91, 105–121, fig. 1*).—The results of experiments, most of which are continuations of those previously noted (E. S. R., 58, p. 354), are reported.

Soy beans need not be ground for cattle.—A 200-day calf feeding test by H. P. Rusk and R. R. Snapp showed that cottonseed meal excelled either ground or whole soy beans as a protein supplement to a ration of shelled corn, corn silage, and alfalfa hay. Whole soy beans, which are hard to chew, produced greater gains at less cost and returned a larger profit than did ground beans. Soy bean oil meal was equal to cottonseed meal in all respects.

Merits of steers and heifers determined.—Continuing the comparison of steer and heifer calves as baby beef producers, Rusk and Snapp found that heifer calves reached a market finish sooner than the steers and were better suited to feeding periods of 150 to 180 days' duration. However, over a feeding period of sufficient length to produce prime baby beeves, the steer calves returned a greater profit because of the higher prices they commanded.

Practices in fattening western calves compared.—In a study with western calves, Rusk and Snapp found that while there was little change in the rate of gain of medium-weight calves from 112 to 214 days, the cost of gains and necessary selling price increased steadily. However, the increase in market value more than offset the increase in cost. This work indicated that at least 200 days were necessary to produce the most desirable finish and in this test the most profit.

There was little difference in the rate of gain of heavy, medium, and light weight calves of the same general breeding. However, the light calves made the most economical gains, costing approximately $1 less per 100 lbs. than the medium-weight calves, which in turn cost about $1 less per 100 lbs. of gain than the heavy calves. The returns per bushel of corn varied inversely with the age and weight of the calves.

Calves fed ear corn silage made slower but more economical gains than those fed shelled corn. Adding bone meal to the ear corn silage ration did not increase the rate of gain nor the profit, but alfalfa hay increased both these factors.

It was found that a medium amount of nitrogenous concentrates in the ration gave the most satisfactory results for finishing calves, indicating that the practice of feeding without legumes or protein supplement should be discouraged.

Sweet clover sometimes disappointing.—A 33 per cent stand of sweet clover during the 1927 season proved too thin to support cattle, and a supplementary feed of green stover silage and soy bean oil meal had to be fed after 3 weeks. Only 32.5 net pasture days per acre were obtained from this second-year sweet clover.

A 5-acre field was seeded with Sudan grass at the rate of 20 lbs. per acre, while a similar field was seeded with a mixture of 10 lbs. of Sudan grass and 1 bu. of soy beans on May 20. On July 18, 5 cows and 4 spring calves were turned on each plat. While the Sudan grass was eaten with great relish, the soy beans were scarcely touched until the grass was eaten well down. Each field supported its quota of cattle till September 10, and the two fields carried 1 lot of cattle to October 21.

No danger of poisoning from clean sweet clover.—Tests by R. Graham, E. C. McCulloch, and H. S. Grindley indicated clearly that it was not entirely safe to feed moldy sweet clover hay even in relatively small amounts. However, the danger was lessened when fed in connection with other good forages. Alternating with good hay every 10 to 15 days reduced the danger of serious losses. Careful tests for oxalic acid in the moldy hay gave negative results, showing that this product had no part in the loss of the clotting power of the blood resulting from feeding moldy hay.

Wastage mounts as amount of feed is increased.—A 4-year-old steer was fed at five levels of feeding by H. H. Mitchell, T. S. Hamilton, et al. At the highest level of feeding, the animal received 22 lbs. of ground yellow corn, 6.6 lbs. of cut alfalfa hay, 0.55 lb. of linseed meal, and 0.28 lb. of molasses per day. At successive lower levels the weight of each feed was reduced one-fifth. After 10 days of preliminary feeding, the excreta were collected for the succeeding 10 days, and during this period the steer was put in a respiration chamber for 3 days. Heat production was determined for 3 days of a fast when the steer was at a maintenance level of feeding and during the final period.

The heat production for the first fasting period for a day of 12 hours standing and 12 hours lying averaged 9,360 calories, and in the second fasting period 9,108 calories. Underfeeding for 6 weeks did not lower the heat output. During the first fast the heat output per square meter of body surface was 1,755 calories daily, and during the second fast 1,818 calories. As the amount of feed increased the heat output increased from 9,394 to 10,212 calories for the one-fifth feed, 13,400 for two-fifths, 15,111 for three-fifths, 16,892 for four-fifths, and 19,854 for the high level of feeding. At the high level of feeding the pulse rate was 77 per minute, 59 on a three-fifths ration, 52 on two-fifths, and 40 on one-fifth ration.

Feeding rate determines speed of feed's passage.—After being on an approximate maintenance ration of alfalfa hay and corn for 10 days, 4 animals were fed by capsule 40 gm. of impure ferric oxide, containing a little more than 40 per cent iron, for 2 weeks by Mitchell, Hamilton, and C. H. Kick. A comparison of the iron in the feces and the dry matter with the amounts ingested suggests that the rate of feeding may be an important factor in determining the time of passage of food through the digestive tract. In other words, the food consumed clears the tract of residues from preceding meals in proportion to its mass. The slowness with which the postabsorptive condition was established in the steers indicates that it may be affected by fasting, but its effect upon heat production for all practical purposes may be considered as over after 4 or 5 days of fast.

Steers digest two hays better than do sheep.—In a study of the digestibility of alfalfa and timothy hay by steers and sheep, Hamilton and Kick fed 4 steers on a maintenance ration of alfalfa hay followed by a similar period on timothy hay. Samples of the same hay, with the addition of a small amount of linseed meal, were fed to 10 sheep. On the alfalfa hay ration 45.3 per cent of the gross energy was metabolizable for the steers and 45.5 per cent for the sheep. On the timothy hay ration 40.7 per cent of the gross energy was metabolizable for the steers and 36.9 per cent for the sheep.

Preliminary work is reported on a new method of conducting digestion trials designed to shorten and to reduce the cost of the present method. The method is based on the feeding of an insoluble substance, such as chromium or ferric oxides, in constant amounts and comparing its ratio to the nutrients in the feeds consumed with its ratio to the nutrients in the feces used as the basis for calculating the digestibility.

Steer feeding [at the Kentucky Station] (*Kentucky Sta. Rpt. 1927, p. 29*).—A comparison of methods of wintering steers to be finished on grass was conducted with 2 lots of animals, averaging 900 lbs. per head. Lot 1 received corn during the winter and was finished on grass without grain, while lot 2 was carried through the winter on roughage and finished on grass with corn. Lot 1 made an average gain of 301 lbs. and lot 2 318 lbs. per head. Lot 2 sold for 75 cts. more per hundredweight than lot 1 and returned a greater profit per head in spite of the fact that the pork credit for these steers was only about one-fourth as great as in lot 1. There was no significant difference in the dressing percentage of the 2 lots.

Beef cattle feeding investigations, W. L. BLIZZARD (*Oklahoma Sta. Bul. 179 (1928), pp. 8, figs. 7*).—In determining how much cottonseed meal should be fed to fattening calves, 5 lots of animals averaging approximately 315 lbs. per head, with 9 calves in lot 1 and 10 in each of the other lots, were fed for 200 days. All lots received ground corn, alfalfa hay with the exception of lot 5 which received prairie hay, and ground limestone at the rate of 2 per cent of the grain ration except lot 4. Cottonseed meal was fed at the rate of 1.5 lbs. per head in lot 1, 2.5 lbs. in lots 2, 4, and 5, and 3.5 lbs. in lot 3.

The average daily gains in the respective lots were 2.02, 1.83, 1.98, 1.89, and 1.88 lbs. per head. The cost of 100 lbs. of gain was cheapest in lot 1, followed in order by lots 5, 3, 4, and 2. The finish attained in lots 1 and 3 was approximately the same, as indicated by the selling price. Lot 1 returned the greatest profit per head, followed in order by lots 3, 5, 2, and 4. The calves in lot 3 received an average of 3.2 lbs. of cottonseed meal per day for 200 days without any bad effects, and this work indicates that the feeding of ground corn and alfalfa hay with the addition of limestone makes it possible to feed cottonseed meal in larger amounts over a longer period than was commonly supposed.

Beef cattle feeding investigations: Progress report, W. L. BLIZZARD (*Oklahoma Sta. Bul. 184 (1928), pp. 4, fig. 1*).—A group of 25 cows was divided into 3 lots of 10, 7, and 8 head per lot, respectively. Those in lots 1 and 2 were scrubs, while those in lot 3 were high grades. A scrub bull was mated to the cows in lot 1 and a purebred bull to the cows in lots 2 and 3.

There was no significant difference in the cost of maintaining any of the lots. The calves dropped in the different lots were weaned on November 1 and were given a grain ration until January 12 when they were placed on full feed for 205 days. There were 8, 4, and 6 calves in the respective lots. The ration fed consisted of shelled corn, cottonseed meal, and alfalfa hay, with cottonseed hulls the first 156 days. Body weights and measurements of 11 parts of the body were made, both at the beginning and end of the experiment. The average daily gains were 1.69, 1.85, and 1.83 lbs. per head in the respective lots.

Lot 1 had the highest feed cost per 100 lbs. of gain, followed in order by lots 3 and 2. Lot 3 attained the highest finish and sold for $1.25 more per hundredweight than lot 2 and for $3.50 more than lot 1. The profit per head, including pork, was approximately twice as great in lot 3 as in lot 2, and the latter lot returned a profit nearly five times as great as lot 1. The final measurements showed a decided increase in the width of the hind quarters during the test, and especially was this true in lot 3, indicating that quality cattle show a greater development in the high-priced cuts.

[Experiments with sheep at the Illinois Station] (*Illinois Sta. Rpt. 1928, pp. 148–158, figs. 3*).—Results of several experiments are noted.

Self-feeding of lambs shows merit in tests.—In a comparison of hand and self-feeding lambs, W. G. Kammlade found that when the ration consisted of ground corn and ground alfalfa hay in the proportion of 1:4 at the start and 1:1 after 7 weeks of feeding, lambs made faster and more economical gains than when hand fed shelled corn and alfalfa hay.

Field feeding on good pasture produced as good gains as are frequently obtained in dry lot feeding. On the other hand, field feeding was not as safe as dry lot feeding, and the danger of annoyance and loss by dogs and hunters was greater. However, the gains and low carrying and equipment charges made it a practical method on many farms.

Good feeding of ewes reflected in lambs.—The effect of good feeding of ewes on the strength and vigor of lambs produced was studied by Kammlade, H. H. Mitchell, and R. Graham from September 21 to November 18. Fifty-one grade native ewes were run on mixed pasture, and all but 6, which were in lamb when purchased, were bred to 1 ram. From the latter date to December 21 they were run in a field of cornstalks. For the entire period they received no hay or grain and lost on the average 6.2 lbs. per head, most of which loss occurred in the cornfield. From December 21 to lambing time, lot 1 (17 ewes) received an average daily feed of 0.8 lb. of grain (shelled corn and oats equal parts by weight), 1.56 lbs. of alfalfa hay, and 0.62 lb. of oat straw, lot 2 received 0.75 lb. of grain, 0.81 lb. of timothy hay, and 0.58 lb. of oat straw, and lot 3 received a ration similar to lot 2 except that they were fed molasses to the extent of 15.4 per cent of the grain ration for one month before lambing. The lots were on these rations 71, 75, and 77 days, and during this time gained 18.5, 6.9, and 5.6 lbs. per head, respectively. The birth weight of lambs in lot 1 averaged 8.8 lbs., in lot 2 5.9 lbs., and in lot 3 7.43 lbs. In lot 1 1 lamb died, in lot 2 9, and in lot 3 7. The largest, strongest, and most vigorous lambs were produced in lot 1, followed in order by lots 3 and 2.

Timothy superior to alfalfa in net energy value.—Continuing this comparison of the net energy value of timothy and alfalfa hay (E. S. R., 56, p. 367), Mitchell, Kammlade, and T. S. Hamilton fed a group of 7 yearling western wethers a ration of 1 lb. of alfalfa hay and 0.08 lb. of linseed oil meal per 100 lbs. of live weight. A similar group of 6 wethers received timothy hay instead of the alfalfa. The latter sheep also received 6 gm. per head of steamed bone meal. After 100 days of feeding all animals were sheared, and digestion and metabolism trials conducted with each animal. After 112 days the rations were reversed for a like period, and the digestion and metabolism trials repeated.

A group of 6 similar sheep were killed at the beginning of the test, and on the basis of live weight were found to contain on the average 40.57 per cent of dry matter, 16.32 per cent of protein, 19.66 per cent of fat, 3.52 per cent of ash, and 0.8 per cent of calcium. Fill averaged 12.4 per cent of the live weight. A comparison of the wool shorn from the 2 experimental lots showed no significant differences in quantity or composition. All sheep lost steadily throughout the test.

The dry matter of the timothy ration averaged 82 per cent as digestible as that of the alfalfa ration, the crude protein 53 per cent, and the nitrogen-free extract 86 per cent as digestible. The digestibility of the crude fiber and ether extract was practically identical. The same weight of dry matter in the timothy ration contained only 79 per cent as much metabolizable energy as the alfalfa ration. On the average 45.5 per cent of the gross energy of alfalfa and 36.9 per cent of timothy were metabolizable. The average nitrogen balance was —0.15 gm. per day on alfalfa and —1.47 gm. on timothy.

During the second part of the test, 5 of the 6 sheep on alfalfa and 3 of the 7 on timothy hay died of undernutrition. The remaining sheep were slaughtered, and on analysis it was found that on a live weight basis they contained on the average only 4.6 per cent of fat. The proportion of protein to moisture was decreased by undernutrition, especially in the muscles and bones. The rate at which protein and energy were deposited in the wool of sheep on submaintenance ration was normal as compared with that of sheep on production rations. During the period of wool growth the bodies of the sheep lost 71.2 per cent of their fat, 47.7 per cent of the gross energy content, and 6.6 per cent of their protein. The data for both periods showed that 20 per cent less metabolizable energy was required in the timothy hay than in the alfalfa hay ration.

Check formulas for surface area of sheep.—The area of the skins of 14 shorn sheep was measured by Mitchell by outlining the hide on a floor and then placing on the outline a rack containing cross wires 1 dm. apart and counting the squares and fractions of squares. The formula adapted to these data was

$$S=kW^n\frac{N_m}{N_{obs}},$$

in which N_{obs} is the ratio of cube root of the body weight to body length and N_m is the maximum value of this ratio for the species. The average percentage error with this formula was 2.4, and the coefficient of variation 3.45.

[Experiments with swine at the Illinois Station] (*Illinois Sta. Rpt. 1928, pp. 125–140, fig. 1*).—The results of experiments, some of which are continuations of work previously noted (E. S. R., 58, p. 357), are reported.

Oats given further trial as swine feed.—W. E. Carroll and R. A. Smith fed 2 lots of 20 pigs each on identical rations of shelled corn, oats, and protein supplement free choice, the only difference being that lot 1 received coarsely ground oats and lot 2 finely ground oats. Lot 1 made an average daily gain per head of 1.28 lbs. and lot 2 1.12 lbs. At no time did the pigs in lot 1 eat more oats than corn, while during 5 of the 9 2-week periods in the test lot 2 consumed more oats than corn. The pigs in lot 2 required 2 weeks longer to reach market weight than those in lot 1, but the feed requirement per 100 lbs of gain and the selling price per hundredweight were practically identical in both lots.

Further work included 10 lots of 20 pigs each fed in dry lot during the summer. One lot was fed cracked corn and was used as a check. In the other lots whole oats, finely ground oats, and hulled oats were fed in the proportion of 1 part to 4, 3, and 2 parts, respectively, of cracked corn. A protein supplement, salt, and water completed the rations. That the whole oats were less palatable than the ground or hulled grain was indicated by the effort of the pigs to separate the whole oats from the corn. No great differences were found in the efficiency of the various rations nor did the varying proportion of oats to corn affect the rate of gain. The proportion in which oats were fed did not seem to have any regular or consistent effect upon their replacement value of corn and supplement. When finely ground, 100 lbs. of oats saved on the average when compared with feeding them whole 8 lbs. of oats, 26 lbs. of corn, and 4 lbs. of supplement. The hulled oats replaced on the average 110 lbs. of whole oats, 29 lbs. of corn, and 9 lbs. of supplement.

Carroll and G. E. Hunt self-fed 4 groups of 20 growing-fattening pigs each rations composed of cracked corn, cracked corn and whole oats 3:1, cracked corn and coarsely ground oats 3:1, and cracked corn and finely ground oats 3:1. Protein supplement, water, and salt were also allowed each lot. The whole and coarsely ground oats again proved less palatable than the finely ground oats. The daily gains were practically the same in all groups, but the check ration required less feed to produce 100 lbs. of gain than did the rations containing oats. It was calculated that 100 lbs. of whole oats replaced 76 lbs. of corn; 100 lbs. of coarsely ground oats replaced 82 lbs. of corn and about 3 lbs. of supplement; while 100 lbs. of finely ground oats saved 72 lbs. of corn, but 5 lbs. more supplement was eaten.

Study ingredients in complex mineral mixtures.—Continuing this study (E. E. R., 58, p. 398), Carroll and H. H. Mitchell, by a refinement in their method of determining iron in feeds, found changes in the iron content as previously noted. No significant differences in the worm content of the intestines of pigs that could be attributed to the feeding of ferrous sulfate were found. There were indications that copperas may be slightly beneficial in combination with a soy bean oil meal ration, but when fed with tankage its effect, if any, was to retard growth. Analyses showing the iron content of various feeding stuffs are reported.

Measure food requirements for pregnancy in swine.—In a study of the nutrient requirements for fetal growth, Mitchell, T. S. Hamilton, Carroll, and Hunt have undertaken a physical and chemical examination of the uterus and contents of sows killed at different stages of gestation. Eighteen bred gilts were used, and after the fifth week of gestation 1 to 3 gilts were slaughtered weekly. It was found that there was a rapid growth of fetuses during the last quarter of the gestation period. During pregnancy the size of the uterus of the pregnant gilt increases from 15 to 17 times that of the nonpregnant gilt. The membranes attain their maximum weight at the end of the first half of the gestation period, while the weight of fluids increased to the eighth week and then showed unaccountable variation up to parturition.

No way found to avoid soft pork from soy beans.—Final results in this work by S. Bull and Carroll showed that while corn and tankage produced hard carcasses, corn and 20 per cent of soy beans produced soft carcasses in all but one case. Changing pigs which were soft at 150 lbs. in weight from a ration of corn and soy beans to a ration of corn and 10 per cent of tankage had some hardening effect as was shown by the fact that only 5 of these carcasses were soft at 225 lbs. Changing hogs that were soft at 175 lbs. in live weight to the above ration had some hardening effect, but not enough to make the practice profitable. Three years' results have shown that soy beans, either in dry lot or on pasture and fed in excess of 12 per cent, produced carcasses that graded medium soft or lower. No indications were found that breed or rate of gain had any effect upon the type of carcass produced.

[Experiments with poultry at the Illinois Station] (*Illinois Sta. Rpt. 1928, pp. 167–174*).—The results of experiments, some of which have been continued from previous reports (E. S. R., 58, p. 360), are noted.

Egg hatchability not improved by wheat-germ oil.—Leghorn hens were grouped on the basis of first-year egg production into 2 groups that essentially consisted of 20 pairs, each one of any pair having laid approximately the same number of eggs as the mate in the other group. The same ration was fed both lots by L. E. Card, except that lot 2 received in addition 2 per cent of wheat-germ oil, known to be a vitamin E carrier. The test began in December and continued to May. Full brother males alternated every three days between the pens were used.

Lot 2 began laying 4 weeks earlier than lot 1, but the total egg production for 20 weeks was about equal. From about the first of March to the middle of April weekly settings of eggs were made from each lot, and for this period there were 505 eggs available from lot 1 and 437 eggs from lot 2. The percentage of all eggs hatched was 56 for lot 1 and 36.2 for lot 2, while the percentage of fertile eggs hatched was 58.7 and 41.5 per cent, respectively. It was evident that the addition of wheat-germ oil did not improve the fertility or hatchability of eggs from White Leghorn hens.

Chickens show need of vitamin E for reproduction.—Preliminary work by H. P. Morris and H. H. Mitchell has shown the necessity of vitamin E for reproduction in chickens. Of 6 male and 12 female chicks fed a synthetic diet very low in vitamin E, 2 hens survived and began laying when 9 months old. One hen laid 89 eggs, 5 of which proved fertile. In the incubator very slight development took place in 3 of these eggs, and in the other 2 the embryos developed to a length of 9 and 11 mm., respectively. When 2 per cent of wheat-germ oil was added to this hen's ration, she produced 10 eggs, 8 of which were fertile and from which 4 normal chicks were hatched.

Measure heating effect of foods on chickens.—Continuing this study (E. S. R., 57, p. 663), Mitchell found that ground wheat had a perceptibly higher heating effect than ground corn. In 7 tests the heating effect of ground wheat averaged 63 calories per 100 gm., and in other tests the average was somewhat higher.

Soy bean meal as good as meat scrap for chicks.—Card found that 20 parts of soy bean oil meal supplemented with 4 per cent of steamed bone meal and 1 per cent of salt to supply minerals could replace 20 parts of meat scrap in the ration of young chicks. It was also found that when 4 per cent of bone meal was added to a ration containing 20 per cent of meat scrap, the chicks did not grow normally and developed symptoms similar to rickets. This condition almost disappeared if the bone meal was removed by the time the chicks were 4 weeks old. Chicks receiving 10 per cent of steamed bone meal weighed 235 gm. at 8 weeks of age as compared with 429 gm. for chicks receiving only 2 per cent.

Iodine fails to influence chick growth.—In a test of 17 weeks' duration T. S. Hamilton and C. H. Kick fed 6 groups of 3 6½-week-old chicks each the same basal ration. One chick in each group received 0.5 mg. of potassium iodide per 100 gm. of body weight, another 1 mg. of potassium iodide, and the third was used as a check. The average body weight of all birds throughout the test was 735 gm., and on this basis the birds receiving the 0.5 mg. of potassium iodide consumed in all 3.36 mg. of iodine daily, and the other group 6.18 mg. At no time was there any apparent difference in the health or rate of growth of any of the groups. The results indicated that with a good mixed ration the addition of iodine produced neither harmful nor beneficial effects upon the growth of chicks.

[Experiments with poultry at the Kentucky Station] (*Kentucky Sta. Rpt. 1927, pt. 1, pp. 21–25*).—The results obtained over a period of two years (E. S. R., 58, p. 67) show that when pullets receive all the sour milk they will consume the amount of meat scrap in the ration need not exceed 5 per cent and that 2.5 per cent gave very satisfactory results and economical production.

In a comparison of high-grade white limestone and common ground limestone 2 lots of 25 pullets each were fed for 2 years. The first year the birds receiving the high-grade limestone had an average annual production of 134.3 eggs each, while the other lot averaged 109.7 eggs per bird. The production for the second year was 166.6 and 149.8 eggs per bird in the respective lots. Some of this variation was attributed to the fact that the common limestone is less attractive and less palatable than the higher grade product.

April-hatched pullets began laying one month later than March-hatched pullets but had an average of 10 eggs per bird more for the year, 9 of which eggs were laid between October 1 and January 31. The cost of producing the April birds was less than for those hatched in early March.

A comparison of types of ventilators at the Robinson Substation upon egg production showed no significant difference between the open front (baffler) and simplex type ventilators.

Continuing the study of calcium compounds (E. S. R., 59, p. 264), results indicated that the ability of hens to utilize the calcium of certain compounds was not noticeably affected by the alkalinity or acidity of the ash.

Calcium carbonate, calcium sulfate, and precipitated tricalcium phosphate added alone or in combination to a mash of yellow corn, middlings, salt, and cod-liver oil 80:20:1:2, supplemented with skim milk ad libitum were fed to growing chicks. The calcium content was maintained at a constant level in the various rations. No differences in the consumption of feed were noted, but growth curves showed that the lots receiving tricalcium phosphate grew better and that their general condition was better. The bones of chicks so fed were heavier and contained more calcium and phosphorus than those in other lots. Mortality in the various lots was practically the same.

Rapid growth of chicks on rations of natural foodstuffs, A. G. Hogan, C. L. Shrewsbury, and H. L. Kempster (*Jour. Agr. Research [U. S.], 37 (1928), No. 2, pp. 115–121, figs. 4*).—Rations, consisting of natural foodstuffs or readily available commercial feeds, which promote unusually rapid growth of chicks under laboratory conditions (E. S. R., 54, p. 369) are described. About 10 per cent of the animals so fed developed leg weakness, which was not rickets, nor were any indications of polyneuritis discovered. It was found that the amount of food required to produce a unit of gain on chicks with these rations was similar to the requirements of other animals at comparable stages of growth.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Illinois Station] (*Illinois Sta. Rpt. 1928, pp. 179–192, figs. 4*).—Several experiments are briefly noted.

Fat globules shrink as lactation progresses.—Preliminary studies by M. H. Campbell have shown that the size of fat globules decrease as the lactation period progresses. There was no relation between the time when the fat globules of different cows showed their greatest decrease.

Testing dairy sires presents difficult problem.—W. W. Yapp, in extensive studies, has found no direct measure of a sire's transmitting ability. It has been established that in the long run sire and dam contribute equally to the producing capacity of the daughters. The records of at least 6 daughters should be available as indicators of the sire's transmitting ability. As yet no satisfactory correction factor has been found for the effect of regression.

Thickness affects quality and yield of bean hay.—Continuing this study (E. S. R., 56, p. 271), W. B. Nevens found that the yield of soy bean hay increased as the rate of seeding per acre increased. Shocking beans immediately after mowing withstood heavy and continued rains during one season better than hay cured in any other way. During another rainy season curing in windrows made immediately after mowing produced the best hay.

Late corn types show little silage superiority.—The results of a 5-year study (E. S. R., 58, p. 362) by Nevens have shown little or no advantage in late-maturing varieties of corn for silage. The early varieties reached their maximum weight of forage late in August, but the yield of dry matter continued to increase rapidly for another 4 weeks. A 30 per cent dry matter content has been found to be the optimum for silage of the best quality.

Preliminary work has shown that covering the top of the silage in the silo with an insulating material or treating with a chlorine solution tended to reduce the losses occurring on the surface of the silage.

Investigate charge that soy beans flavor milk.—Samples of raw and pasteurized milk and of pasteurized skim milk and cream from 3 groups of 8 cows each fed by Nevens and P. H. Tracy during 6 consecutive periods of 1 week's duration on rations planned to have contrasting effects as to soy bean tainting showed no flavors that could be traced to the feeding of either soy bean hay or ground soy beans. These feeds had no effect upon the titratable acidity of the milk. The flavor of the butter was not influenced by these feeds, but when judged at 40° F. the butter from cows fed ground soy beans had a somewhat gummy consistency. This condition was not so noticeable when the hay was fed, and in no case was it serious.

Persistency of lactation is definite character.—W. L. Gaines has developed a slide rule especially designed to save time in calculating persistency values. Preliminary comparisons have shown that persistency and the change in fat percentage with advance in lactation are more or less definite characters of the individual cow. The percentage of feed recovered in the form of milk has been designated as the coefficient of efficiency, and the formula

$$\text{Coefficient of efficiency} = 52.6 \frac{\text{F. C. M.}}{\text{F. C. M.} + 8.847\ W}$$

in which W is live weight of the cow in pounds and F. C. M. the average yearly yield of 4 per cent milk in pounds, has been developed to estimate this efficiency.

New device used further to study milking rate.—Gaines describes a new instrument which is being used in the study of the difference between the rate or speed at which cows milk under like conditions.

A preparation claimed to stimulate milk secretion has been tried out with 8 cows at various stages of lactation without any observed effect.

The National Institute for Research in Dairying annual report, 1926–27 (*Univ. Reading., Natl. Inst. Research in Dairying Ann. Rpt. 1926–27, pp. 70*).—The annual report (E. S. R., 58, p. 69) for the year ended July 31, 1927, gives a general account of the institute, and includes brief progress reports of experimental work in the feeding and nutrition of dairy cattle, the feeding value of milk and its chemical properties, and bacteriological studies on milk and dairy products.

Growth in weight of Guernsey cows after the age of two years, C. W. Turner (*Jour. Dairy Sci., 11 (1928), No. 4, pp. 265–269, fig. 1*).—Continuing this series of studies (E. S. R., 49, p. 374) at the Missouri Experiment Station the weights of 2,740 Advanced Registry Guernsey cows are given according to their ages from 2 to 14 years. A smoothed curve of the data was computed from the exponential equation $W_t=A(1-e^{-kt})$, in which W_t is the mean live weight at any age t, A the weight of the animal at maturity, e the base of natural logarithms, and k the parameter indicating the rate of decline of the growth-limiting reaction. The mature weight of the Guernsey was found to be 1,130 lbs.

"It was shown that from the age of first calving at about two years until the age of maximum body weight, the course of growth in body weight can be accurately represented by an exponential equation."

Growth and senescence in Red Danish cows as measured by the rate of milk secretion, W. L. Gaines and D. D. Shaw (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 3, pp. 169–180, figs. 4*).—The data for this study were taken from the records of the ancestors of cows entered in volumes 1, 2, and 3 of the herdbook of the Red Danish dairy breed. The total milk and butter yield of each of four main classes divided according to age were computed, and the average fat percentages and energy yields calculated by a formula previously noted (E. S. R., 50, p. 75). A curve by Davidson (E. S. R., 58, p. 768) was fitted by the method of least squares to 4,109 annual records. From this it was calculated that the maximum yield for this breed, 9,057 lbs. of 4 per cent milk (3,079 therms), was attained during the eigthh year.

[Experiments in dairying at the Illinois Station] (*Illinois Sta. Rpt. 1928, pp. 192–194*).—The results of experiments are briefly noted.

Abortion germs in milk killed by pasteurization.—M. J. Prucha and R. Graham found that animals inoculated with milk infected with contagious abortion which has been pasteurized at 138° F. for 30 minutes did not develop any disease.

Using chemicals on utensils improves milk quality.—That small amounts of dirt in dairy utensils made chemical sterilizers lose their strength rapidly was determined by Prucha, in some cases the sterilizing action being practically stopped. Rough and corroded surfaces were hard to sterilize, due to the fact that the chemical solutions did not seem to penetrate into the rough surface.

Ice-cream tests further economy and quality.—This study by P. H. Tracy and H. A. Ruehe has shown that the temperature to which a mix is lowered in the freezer has an important effect upon the time required to freeze as well as the texture of the ice cream. A mix with a low solid content whipped faster than one with a high solid content. On the other hand, high serum solids gave better whipping qualities than high fat content, while sugar and gelatin retarded whipping. When properly frozen, ice cream should be discharged from the freezer at a temperature lower than its determined freezing point. Hardening in metal containers produced a product of better texture than hardening in paper containers, and the same was true of unparaffined and paraffined containers.

Grades of gelatin compared in ice-cream making.—The results from six freezings each of mixes containing low, medium, and high grade gelatin by Tracy, Ruehe, and J. M. Brannon showed that high-grade gelatin produced a better flavor, whipped faster, and finished at a lower temperature at 100 per cent overrun than mixes containing the other grades.

Physical constants of the milk as influencing the centrifugal separation of cream at various temperatures, P. F. SHARP (*Jour. Dairy Sci., 11* (*1928*), *No. 4, pp. 259–264, fig. 1*).—In a study at the New York Cornell Experiment Station, milk was separated at temperatures ranging from 5 to 80° C. at temperature intervals of 5°. It was found that the effective centrifugal force tending to separate the fat from the skim milk in the separator, operated at constant speed and rate of flow of milk, increased markedly as the temperature of the milk increased up to 35 to 45° (95 to 113° F.). Above this temperature the increase in effectiveness was much less pronounced. The effectiveness was due to the difference in density between the fat and the plasma and to the decrease in the viscosity of the plasma.

Accuracy of drip sample, J. A. NEWLANDER (*N. Y. Prod. Rev. and Amer. Creamery, 66* (*1928*), *No. 8, p. 380*).—The Vermont Experiment Station made a study of various methods and the accuracy of each for sampling milk at a station handling from 17,000 to 18,000 lbs. of milk daily. The tests were made on the runs of six consecutive days, and five sets of samples were taken each day. One sample was taken from each patron's milk as it was received. A true composite was taken of all the milk received, using 10 cc. per 100 lbs. of milk. Drip samples were taken from the pipe through which the milk was pumped from the storage vat to the cooler, and a last sample was a composite of the milk as it was canned for shipment. The drip samples were taken from a 25-ft. section of pipe having a 12-in. slope and were known as the low end and high end drip samples, respectively. All analyses were made in duplicate.

The average fat content for the various samples was 3.68, 3.66, 3.68, 3.69, and 3.65 per cent, respectively, while a composite for 6 days tested 3.7 per cent. The author concludes that the drip method gives as accurate a composite test of a day's run as any measure, and especially was this true of the low end sample where pulsations from the pump were not apparent. An added advantage of the drip sample is that no time is lost in securing it. It is recommended that 4- to 8-lb. drip samples be taken for accurate results.

Can B. coli be used as an index of the proper pasteurization of milk? J. C. SWENARTON (*Jour. Bact., 13* (*1927*), *No. 6, pp. 419–429, figs. 2*).—The pasteurized milk of 16 dairy plants was examined by the Health Department of Baltimore, Md., for the *Bacterium coli* content. This content varied considerably in the milk from the different plants. In those plants in which the control charts from the pasteurizer showed improper heating and irregularity of procedure there was a definite correlation between these factors and *B. coli* content. It was found that the *B. coli* test was a good indicator of plant procedure, for which the following standard is proposed:

A standard portion of milk should be 0.1 cc., and a standard sample should consist of 5 standard portions. *B. coli* presence in 3 or more of the 5 portions of the sample should not be allowed if it occurs in more than 10 per cent of the standard samples when 10 or more samples have been examined, or in 1 sample when less than 10 samples have been examined.

The effect of flash pasteurization of milk upon the flavor and texture of Cheddar cheese, C. A. PHILLIPS (*Jour. Dairy Sci., 11 (1928), No. 4, pp. 292–298*).—In this study at the California Experiment Station, four trials were conducted, using 800 lbs. of raw milk of good quality in each. One half of the raw milk was made into cheese according to the regular methods and used as a check. The other half was forewarmed to 110° F., then passed through a horizontal flash pasteurizer, where it was heated to from 160 to 168°, and due to the length of the pipe running to the cooler the milk was held at this temperature for approximately 25 seconds. It was then cooled to 88° and made into cheese in the regular manner, except that 1 oz. more rennet per 1,000 lbs. of milk and a setting temperature of 88° were used. Following the same procedure, 100 lbs. of milk with bad flavor and odor and with large numbers of gas-forming organisms present was made into a check cheese, while 3,300 lbs. of the same milk was heated. All cheeses were cured at 50° and scored at intervals for flavor and texture.

Pasteurizing milk by the flash method to a temperature of 168° improved the quality of cheeses made from poor milk, but caused no uniform improvement in the cheeses made from milk of good quality. Pasteurizing gassy milk to 176° produced cheeses of better quality than if raw milk had been used. Higher temperatures than 168° tended to produce weak texture, scorched flavor, and sometimes bitter flavors in the resultant cheeses. The average yield of cheese manufactured from heated milk was 9.49 lbs. of cheese per 100 lbs. of milk testing 3.34 per cent butterfat. The average loss of butterfat in the whey was 0.169 per cent from heated milk and 0.222 per cent from raw milk.

A comparison of certain methods for determining the sanitary quality of ice cream, J. WEINZIRL and L. S. HARRIS (*Jour. Dairy Sci., 11 (1928), No. 4, pp. 284–291*).—In an endeavor to find a means for determining the sanitary quality of ice cream, 124 samples, including all the common varieties, were subjected to the following tests at the department of bacteriology, University of Washington: (1) Total count of bacteria, (2) colon group test, and (3) anaerobic spore test.

The total count was effective for showing the results of contamination and of subsequent multiplication of bacteria, but did not distinguish between the two. The colon test gave results similar to the total count, but was somewhat more specific in indicating insanitary conditions. The anaerobic spore test showed only insanitary conditions, but with ice cream it did not differentiate between spores introduced through insanitary conditions and those added with sugar and possibly with other products. The first two methods are of no value for testing freshly pasteurized products except for determining pasteurizing efficiency, but are especially suited to determining subsequent contamination, while the third method shows contamination in either pasteurized or unpasteurized products.

VETERINARY MEDICINE

[Work in comparative pathology at the Kentucky Station] (*Kentucky Sta. Rpt. 1927, pt. 1, pp. 25–29*).—Studies were made of several enzootics of taeniasis due to *Davainea proglottina*, a species not commonly met with in the United States and which does not exceed ⅛ in. in length. It was found that the birds that contained a large number of the tapeworm were from flocks in which the so-called paralysis or range paralysis was reported as the principal trouble.

Studies of the fermentative characters of *Bacterium pullorum* indicated that while it may produce acid when cultivated for long periods of time in maltose broth, yet the organism does not attack dextro-maltose, nor does it produce an immediate acidity in maltose serum water when unheated maltose is used in the tests. The results obtained indicate that lactic acid production in maltose broth by *B. pullorum* is due to the fermentation of products resulting from the alkaline hydrolysis of the sugar, and not from the direct action of the bacterium on the maltose.

A brief account is given of work with joint ill and septicemia in foals caused by *B. viscosum equi* (E. S. R., 59, p. 780).

The progress of work with infectious abortion of cows and mares is next reported upon. The bacterin treatment for this disease in the bovine was administered to 1,246 head of cattle on 52 farms. A bacterin made from *B. abortus equi* was administered to 1,799 mares on 53 farms, the investigations showing that it protects the mares from the disease. A bacterin was also administered to 397 head of swine on 11 farms.

In order to determine the varying agglutinating properties of different strains of *B. abortus* a number of antigens were used, as many as 20 made from different strains of the organism being at times employed. It was found that a few cows would respond negatively to an antigen made of a particular strain and positively to another strain. The results of the investigation with 28 herds of cows, involving 182 head, showed that the blood from 47 cows reacting positively to one of the several or many antigens reacted negatively to the stock antigen ordinarily used. This variation is considered to account for the occasional variation in tests of the same blood of a cow or cows sent to different laboratories.

Mycobacterium paratuberculosis, the cause of Johne's disease in cows and scrapie in sheep, was isolated and cultivated, it being the second time that the organism has been isolated in the United States and the sixth time that it has ever been isolated.

An analysis was made of the normal urine of sheep, the findings in which are reported upon. It was found that in acidosis of pregnant ewes the calcium content of the blood was considerably lower than the calcium content of the blood of normal ewes.

The use of Volck against external parasites of domestic animals, W. G. Bruce (*Jour. Kans. Ent. Soc., 1 (1928), No. 4, pp. 74–79*).—This report of work with the white oil emulsion known as Volck is contributed from the Kansas Experiment Station.

A 7 per cent solution of this insecticide was found effective against the large hen louse, *Goniocotes abdominalis* Piag.; the body louse, *Menopon biseriatum* Piag.; and the shaft louse, *M. pallidum* Nitz. of poultry. An 8 per cent solution, also applied as a dip, destroyed the tropical fowl mite, *Liponyssus bursa* Berlese. Solutions of 50 and 60 per cent used in four poultry houses destroyed the chicken mite. A 10 per cent solution was effective against fleas on dogs and cats and against sucking lice on cattle. An 8 per cent solution was effective against biting lice of cattle, with no harmful effect upon the animals. Satisfactory results were obtained from the use of an 8 per cent solution against hog lice. Undiluted Volck proved very satisfactory when applied in the destruction of the eggs of botflies on horses, but no noticeable effect was obtained from the application by injection of a 50 per cent solution into the cyst of the ox warble. It was absolutely harmless to the animals treated in the experiments.

Trypanblue and certain dithio-aniline derivatives: Their efficacy in the treatment of piroplasmosis and other affections in the Central Provinces, R. F. Stirling (*Vet. Rec., 8 (1928), No. 33, pp. 675–677*).—This is an abstract of an article previously noted (E. S. R., 59, p. 673).

Studies on the metabolism of the abortus-melitensis group.—IV, Effect of various concentrations of carbon dioxide, J. G. McAlpine and C. A. Slanetz (*Jour. Infect. Diseases, 43 (1928), No. 3, pp. 232–240, fig. 1*).—In this continuation of the studies previously noted (E. S. R., 58, p. 875), it was found that by the addition of from 5 to 10 per cent of carbon dioxide to bell jars containing inoculated plates the growth of the bovine strains of *Bacterium abortus* which had been acclimated to aerobic conditions was markedly accelerated. On the other hand, this amount of the gas had a more or less inhibitory action on *B. abortus* strains of porcine and human origin, and on *B. melitensis*. This acceleration of growth for the bovine strains and inhibition for the porcine and human strains of *B. abortus* and of *B. melitensis* was apparently not due to changes in the H-ion concentration of the mediums. Total exclusion of carbon dioxide rendered the members of the abortus-melitensis group inert and unable to proliferate.

Comparative studies of the agglutinin isolates of M. melitensis and B. abortus [trans. title], C. F. Cerruti (*Bol. Ist. Sieroterap. Milan, 6 (1927), No. 6, pp. 425–440; Fr. abs., pp. 438, 439*).—A report of studies conducted with three strains of *Brucella melitensis* of human origin and with three of *B. abortus* of animal origin obtained from Hungary, where undulant fever (Bruce) does not commonly occur. It is presented in connection with a list of 40 references to the literature.

The thermal death point of Brucella abortus in milk, R. Boak and C. M. Carpenter (*Jour. Infect. Diseases, 43 (1928), No. 4, pp. 327–329*).—The authors have found the thermal death point of eight strains of *B. abortus* of porcine, human, and bovine origin grown in milk to be variable. An exposure of 15 minutes at 140° F. destroyed the human and bovine cultures that were examined. The porcine strain was the most resistant, being still viable at 140°. Injection into guinea pigs was found to be more reliable than cultures for determining the viability of *B. abortus* in milk.

Investigations of the rôle played by the Bang abortion bacillus as a pathogenic microbe in man, M. Kristensen (*Ugeskr. Laeger, 89 (1927), No. 49, pp. 1123–1141, figs. 34; abs. in Cornell Vet., 18 (1928), No. 3, pp. 294–300; Jour. Amer. Med. Assoc., 90 (1928), No. 6, p. 498*).—This is the report of an address presented before the Medical Association of Copenhagen, November 29, 1927. A description is given of the technique and the work conducted where both organisms were agglutinated by serum from patients with undulant fever (Bruce) as well as serum from patients with undulant fever (Bang). During the period from April 1 to November 15, 1927, 1,375 samples from 1,177 patients were tested by the author, of which 89 gave positive reactions. Since only 0.4 per cent of positive reactions were obtained in tests of 3,175 seras that had been sent in for Wasserman tests (thus from patients presenting altogether different symptoms), it is concluded that this test for *B. abortus* is very specific even to such high degree as the reaction for typhoid and paratyphoid.

It is pointed out that none of the 89 positive cases, 68 males and 21 females, occurred in children under 13 years, who consumed much milk. The disease was not epidemic but occurred over the whole country, and there was never more than one case in a family. It is considered to be most often wrongly diagnosed as typhoid or paratyphoid, influenza, generalized or occult tuberculosis, and sepsis. The author is of the opinion that the infection is incidental or accidental, and that there is not any special variety of the organism that is particularly virulent for man.

Recent cases of undulant fever in New York State, R. Gilbert and M. B. Coleman (*Jour. Infect. Diseases, 43 (1928), No. 4, pp. 273–279*).—This is a contribution from the New York State Department of Health in which reports are given of 21 cases of undulant fever.

The investigation is considered to demonstrate that cases of this disease are not uncommon, and that they are distributed rather generally throughout New York State. In none of the cases studied was there a history of contact of patient with goats or hogs, but 14 patients were known to have used raw cow's milk. In 9 instances, abortions were found to have occurred in the herds from which the milk was obtained.

"A consideration of the data available indicates 3 possible reasons why cases of undulant fever are not reported more frequently in districts where unpasteurized milk is used from herds in which contagious abortion is prevalent. Many of the severe infections have probably been diagnosed as atypical cases of typhoid fever, influenza, or even tuberculosis or malaria; mild forms may have presented so few symptoms that physicians have not been consulted: and the blood from some cases of undulant fever may not have agglutinated cultures of *Brucella melitensis* or *B. abortus*."

Third progress report of the Foot-and-Mouth Disease Research Committee, C. J. MARTIN ET AL. (*London: Min. Agr. and Fisheries, 1928, pp. 141, pls. 22, figs. 2; rev. in Vet. Rec., 8 (1928), No. 34, pp. 689, 690*).—In this third report of the research committee of ten (E. S. R., 57, p. 77), the work is summarized in the first part of the publication (pp. 7–24). It is presented under the headings of propagation of the virus; multiplication, distribution, secondary localization, and disappearance of the virus in animals after inoculation; survival of the virus outside the bodies of living animals; disinfection of material contaminated by the virus of foot-and-mouth disease; destruction of the virus by heat; plurality of the types of virus; determination of type by the method of complement fixation; further experiments on the susceptibility of wild animals; immunity; and treatment of foot-and-mouth disease.

With one exception, all the types of those examined responsible for outbreaks in Great Britain have proved to be identical with Vallées type O; the single exception was identified as Vallée's type A. Examination made at the Lister Institute, where three methods were used for distinguishing types, substantiated the contention of Waldemann and Trautwein (E. S. R., 57, p. 278) that a third type exists, Vallée's type A being identical with Waldemann's type B and Vallée's type O the same as Waldemann's type A, Waldemann's type C being a new type.

The body of the work consists of four appendixes, as follows: (1) Detailed Report of Work at the Ministry's Veterinary Laboratory, New Haw, Weybridge, by F. C. Minett (pp. 25–39); (2) Detailed Report of Work at the Lister Institute of Preventive Medicine, London, by H. B. Maitland, T. Hare, Y. M. Burbury, and M. C. Maitland (pp. 40–103); (3) Detailed Report of Work at the National Institute for Medical Research, Hampstead, by I. A. Galloway and S. Nicolau (pp. 104–135); and (4) bibliography of foot-and-mouth disease (pp. 136–141).

Appendix 1 is devoted to the subject of disinfection in foot-and-mouth disease. Section 1 (pp. 25–29) deals with the action of various reagents upon the virus in filtered vesicle fluid from guinea pigs, the action of acids, acid salts, and alkalies, and the effect of the addition of sodium hydrate to alcohol and to phenol; section 2 (pp. 30–32) with the action of various reagents upon the virus in guinea pig epithelium in the presence of added organic matter and the effect of the addition of acids and alkalies to certain reagents; section 3 (pp. 32–34) with the time factor in disinfection; section 4 (pp. 34–36) with disinfection of virus dried on various substrata; and section 5 (pp. 36–39) with disinfection of the virus on hay, animal hides, and manure.

The disinfection of hay is said to be of particular importance because of the length of time the virus has been proved to live upon it in certain conditions. In the experiments conducted formalin proved to be efficient for the disinfection of virus dried on hay. Concentrations as low as 1 in 1,000 sprayed on hay and allowed to evaporate destroyed the virus. Formalin was also found to be a useful reagent for destroying the infectivity of epithelium or blood contaminating the surfaces of guinea pig hides. The chief obstacle in the way of complete disinfection of hides is the difficulty of obtaining efficient penetration of blood clot. In two cases out of seven a 1 per cent concentration acting for 24 hours just failed to be effective, but in four cases disinfection was complete when the exposure was prolonged to 48 hours. Soaking the hides for 24 hours in 2 per cent formalin was also effective. When infective epithelium from guinea pigs was buried in heaps of cattle manure approximating 1 cubic meter in size, the virus did not survive for 4 days.

In appendix 2 the first section (pp. 41–51) is devoted to vaccine prepared from foot-and-mouth disease virus, the second section (pp. 52–65) to immunity to foot-and-mouth disease, the third section (pp. 65–70) to the determination of the immunological types to which different strains of virus belong, the fourth section (pp. 70–77) to experiments on the passage of foot-and-mouth disease virus in different species of animals, section five (pp. 78–81) to the duration of infectivity of the tissues of guinea pigs following infection by intradermal inoculation, the sixth section (pp. 81–83) to the treatment of foot-and-mouth disease in guinea pigs with iodine, the seventh section (pp. 84–88) to survival of foot-and-mouth disease virus when dried upon various materials, the eighth section (pp. 88–93) to the survival of foot-and-mouth disease in blood and vesicle fluid at temperatures between 50 and 60° C., the ninth section (pp. 93–95) to attempts to cultivate the virus of foot-and-mouth disease at low oxygen potential, and the tenth section (pp. 96–103) to experiments on the localization of the lesions and on local immunity in foot-and-mouth disease.

Appendix 3 is presented in five parts, namely, (1) histological study of the development of the lesions of foot-and-mouth disease in the tongue of the guinea pig (pp. 104–113); (2) distribution and localization of the virus of foot-and-mouth disease in guinea pigs, rabbits, and ferrets (pp. 114–119); observations on immunity to foot-and-mouth disease in the rabbit, guinea pig, and ferret (pp. 120–127); observations on the virulicidal action of ultra-violet light, bile, various aniline dyes and other germicides upon the virus of foot-and-mouth disease (pp. 128–133); and experiments on the filtration of the virus of foot-and-mouth disease through filters of silicious earth (pp. 133–135).

The bibliography is arranged under the headings of virus and culture, serum and therapy, immunity, pathology and animal experiments, clinical, and miscellaneous.

Research into foot-and-mouth disease, P. BARKER (*Jour. Min. Agr.* [*Gt. Brit.*], *35* (*1928*), *No. 6, pp. 524–533*).—This is a summary of the work of the committee above mentioned from the commencement.

Investigations on foot-and-mouth disease by means of experiments with small animals during 1926–27, H. B. MAITLAND, Y. M. BURBURY, T. HARE, and M. C. MAITLAND (*Jour. Compar. Path. and Ther.*, *41* (*1928*), *No. 2, pp. 123–159*).—This covers the same period of work as the Third Progress Report of the Foot-and-Mouth Disease Committee, noted above.

A diagnostic agent for the detection of Johne's disease and its method of preparation, G. W. Dunkin (*Jour. Compar. Path. and Ther., 41 (1928), No. 2, pp. 94–108*).—The author has found the solid medium here described to be satisfactory for the growth of the bacillus of Johne's disease. Inoculation of cultures on the surface of the liquid medium described produces a good growth in the vast majority of cases. Johnin prepared from the broth cultures as described has proved itself to possess qualities rendering its use as a diagnostic agent for Johne's disease of considerable value.

It was found that the double intradermal johnin test does not interfere with the double intradermal tuberculin test simultaneously applied. It produces no reaction in a normal beast or in an animal suffering from tuberculosis. Postmortem examinations carried out in animals tested, whether reactors or non reactors, have supported the results of the tests previously applied. Individual sensitiveness of cows to the johnin test varies to a much greater extent than in the case of tuberculin and tuberculosis.

An improved vaccine for immunization against rinderpest, R. A. Kelser (*Philippine Jour. Sci., 36 (1928), No. 4, pp. 373–395, figs. 4; also in* [*War Dept. U. S.*], *Off. Surg. Gen., Vet. Bul., 22 (1928), No. 4, pp. 141–156*).—Studies made by the author in collaboration with S. Youngberg and T. Topacio have shown that a highly efficacious vaccine against rinderpest can be prepared from a suspension of finely ground tissues (lymph glands, spleen, liver) from animals killed in the acute stages of rinderpest. The rinderpest virus in such vaccine can be promptly killed, without injuring the product, by the addition of 0.75 per cent chloroform, and such vaccine can be used immediately after preparation and possesses excellent keeping qualities, remaining potent at least one year. It was found that vaccine prepared from blood alone possesses no value whatever as an immunizing agent.

The value of the vaccine has been fully established by tests on a large number of cattle and carabaos. Three 20-cc. doses of vaccine, with an interval of one week between doses, were found to afford both cattle and carabaos a very solid immunity against severe infection. The experimental evidence obtained indicates that the number of injections of vaccine may be reduced from 3 to 1, at least in cattle.

The blood changes in bovine piroplasmosis [trans. title], W. L. Yakimoff, W. J. Wassilewsky, and E. N. Markoff-Petraschewsky (*Arch. Wiss. u. Prakt. Tierheilk., 56 (1927), No. 5, pp. 452–475; abs. in Trop. Vet. Bul., 16 (1928), No. 1, p. 7*).—The changes found in the blood of cattle infected with bovine piroplasmosis include a reduction in the number of red corpuscles, with histological changes, and an increase in the mononuclears and a reduction in the neutrophile polynuclears, together with the appearance of abnormal forms. The blood changes found in 743 animals affected with piroplasmosis and 100 healthy animals are tabulated.

Tuberculosis of the domesticated species of animals, A. S. Griffith (*Jour. Compar. Path. and Ther., 41 (1928), Nos. 1, pp. 53–75; 2, pp. 109–122*).—This is a contribution from the pathological department, Field Laboratories, University of Cambridge, dealing with this disease as found to occur in the various domesticated animals.

"Filtrable forms" of the tubercle bacillus: A critical review and personal observations, F. B. Cooper and S. A. Petroff (*Jour. Infect. Diseases, 43 (1928), No. 3, pp. 200–214*).—The authors failed to obtain growth from Berkefeld filtrates prepared from pure cultures of tubercle bacilli or from sputums which contain large numbers of this organism, and also failed to observe any demonstrable tuberculosis leading to a progressive disease either in the mother inoculated with such filtrates or in the offspring. They were able, however, to demonstrate acid-fast granules in such offspring, and typical acid-fast organisms were found in about 36 per cent of the full grown guinea pigs which had received filtrates. However, they also found these acid-fast organisms in the lymph nodes of 33 per cent of the apparently normal animals which had never been inoculated with this material.

The lesions produced in guinea pigs vaccinated with B. C. G. and tested with a virulent strain of tubercle bacilli [trans. title], P. P. DWIJKOFF and L. P. MASOUROWSKI (*Ann. Inst. Pasteur, 41 (1927), No. 11, pp. 1194–1199; abs. in Jour. Compar. Path., 41 (1928), No. 2, pp. 169, 170*).—Studies made of the lesions produced in animals vaccinated against tuberculosis, when subsequently inoculated with virulent tubercle bacilli, have led the authors to conclude that such inoculation of B. C. G. vaccinated guinea pigs tends to set up an infection the lesions of which show a marked tendency to sclerosis. All the organs react to the infection, though in varying degrees, the sclerosis being more marked in the lymphatic glands and liver than in the spleen and lungs.

Tularemia: Study of rapidly fatal case (four days, seven hours), W. M. SIMPSON (*Arch. Path., 6 (1928), No. 4, pp. 553–574, pls. 2, figs. 11*).—This is a detailed report of a rapidly fatal case in a 25-year-old dresser of rabbits at a market in Dayton, Ohio.

A double intradermal test for the diagnosis of bovine contagious abortion, A. W. HOLTUM (*Jour. Compar. Path. and Ther., 41 (1928), Nos. 1, pp. 25–53; 2, pp. 79–93*).—The experiments reported indicate "that a double intradermal test, using a suspension of organisms killed by heat, is able to detect more reactors than the agglutination test in the light of our present knowledge of that test. Investigation of the maximum value of the nonspecific agglutinins present in the sera of normal cattle will increase the percentage of determinable reactions to the agglutination test, and furnish additional information as to the range of action of the intradermal test.

"It appears possible to detect infection during the various phases in the evolution of the disease. Reactions were obtained at periods from 24 hours to 2 years and 178 days after abortion, as well as in animals at various periods of gestation, in virgin heifers, and in yearlings. Reactors retested after a short interval again gave satisfactory reactions. No animal with a proved history of abortion failed to react to the test. Four strains of organism were used and appeared to be equally efficacious, including a freshly isolated strain and one that had been subcultured for over 18 years. The antigen appears to retain its potency as well when stored at room as at cold storage temperature, and gave as satisfactory results after storage for 5 months at room temperature as after cold storage for 3 months.

"A dose of 0.2 cc. of antigen is a satisfactory amount to inject, as, although it only increases the dermal thickness by 1 mm., it is possible on palpation to make certain that the injection is intradermal even in the case of a very thick dermis. A diffuse swelling at a shaved site reaching twice the initial measurements of the dermal fold, although relatively insensitive as compared with larger reactions, must be considered positive.

"The degree of warmth and tenderness of the swellings varies considerably, large swellings being the most painful. If strict aseptic precautions are taken, the percentage of indefinite reaction should be small. The number of observations required are the same as for the double intradermal tuberculin test, and reactions requiring observations at a later period than 72 hours after the initial injection are rare. The test does not produce any recognizable systemic reaction, and milk yield is unaffected by it. The thickening of the dermis produced in reactors resolves in a few weeks. On practical grounds, therefore, there appears to be no objection to it. The consistent nature of the experimental results appears to warrant the trial of the test under extended field conditions."

Abortion yields to sanitation and testing (*Illinois Sta. Rpt. 1928, pp. 121–124*).—This is a report of the year's work by R. Graham, E. A. Tunnicliff, and E. C. McCulloch carried on in continuation of that previously noted (E. S. R., 58, p. 366). Further proof was obtained that sanitation and testing have done more to control the disease in the State cattle herds than all other procedures employed It is concluded that the agglutination test for the detection of *Brucella abortus* is as accurate a method of diagnosing contagious abortion as is the tuberculin test for tuberculosis. Thirty-six private owners are said to have signed an agreement to control abortion disease by the sanitation plan, 11 abortion-free herds having been established during the year against 7 the preceding year. The importance of avoiding the purchase and introduction of infected animals into the herd is pointed out, a history of the disease in many herds having shown that a mild infection had been allowed to spread. The station dairy herd, which was separated into healthy and infected animals kept in separate quarters over a period of 3 years, has shown the value of abortion control, calves from an infected herd having been raised free from abortion.

A study of the abortion-free herds has shown that a small percentage of the animals of such herds may abort from other causes than *B. abortus*, although approximately 90 per cent of all cattle abortions coming to the attention of the investigators is traceable to *B. abortus*. While abortion has not been produced experimentally by the intravenous injection of pregnant heifers with the *Streptococcus alpha*, it is suspected that this type of infection may be disseminated by breeding.

In approximately 1,000 blood samples submitted for abortion tests the rapid method, first advocated by Huddleson and Carlson (E. S. R., 57, p. 672), was found to compare favorably with the slow method.

Continuation of paper on lamb dysentery, T. Dalling (*Vet. Rec., 8 (1928), No. 40, pp. 841–848, 849*).—This is a continuation of the paper previously noted (E. S. R., 60, p. 179), with discussions by others and a reply by the author.

Skillful feeders can salvage "skip" lambs (*Illinois Sta. Rpt. 1928, pp. 145–148*).—The results of different treatments for the removal of worms from native lambs are reported upon in detail in tabular form by W. G. Kammlade and E. C. McCulloch. They found that these so-called "skip" lambs, which are so thin that they dress carcasses wholly unsuited to practically any kind of retail trade, can be salvaged by the use of either copper sulfate or carbon tetrachloride. While a 3-cc. dose of carbon tetrachloride proved more effective in removing stomach worms than any other treatment, the daily gains were no higher than when 3 oz. of a 1 per cent solution of copper sulfate were given. Three lambs died in the lot given carbon tetrachloride, while only one died in the lot given copper sulfate. Apparently Lugol's iodine has no advantage over copper sulfate, and lambs so treated gained more slowly than any others.

[Hog disease studies at the Illinois Station] (*Illinois Sta. Rpt. 1928, pp. 141–145*).—Immunization work with baby pigs conducted by R. Graham and E. A. Tunnicliff, in which 2,442 pigs of from 1 to 8 weeks of age were injected with potent anti-hog-cholera serum and virus over a 6-year period, a majority being treated at 4 weeks of age with 15 cc. of concentrated serum and 3 cc. of virus, is reported upon in tabular form. Of these pigs, 1,183 were exposed to cholera at market age by injecting them with virus at the rate of 5 cc. each or by exposing them in pens with cholera-sick hogs. In three separate groups of 45, 213, and 373 pigs immunized at 1 month of age, 2.2, 2.81, and 1.07 per cent, respectively, proved susceptible to hog cholera at market age. In a fourth group of 128 pigs none was susceptible. In two other separate groups of 304 and 120 pigs, 11.84 and 10.83 per cent, respectively, proved susceptible to cholera. It is pointed out that while the experimental results indicate that baby pigs can be immunized with considerable success, the practice is not recommended to veterinians and farmers as a general procedure to replace immunization following weaning. The technical results indicate, however, that the procedure can be used under favorable conditions with little danger.

Further work on the resistance of swine to cholera, by E. Roberts and W. E. Carroll (E. S. R., 58, p. 369), and of swine sanitation and the longevity of roundworm eggs in the soil, by E. C. McCulloch, Graham, Tunnicliff, and Carroll (E. S. R., 58, p. 367), is briefly referred to.

Studies on the spread of avian tuberculosis by Graham, Tunnicliff, and McCulloch have shown that this type may be perpetuated in swine independently of contact with infected chickens or contaminated ground. The experiments have established the facts that (1) the avian type of tuberculosis is transmissible to swine; (2) this type of the disease may occur in wild birds and pigeons, as well as in chickens; (3) lymph glands of swine carcasses retained on the Chicago market were infected in a high percentage of cases with the avian type of the disease; (4) when these retained swine carcasses were traced back to the point of origin they were found to come from farms harboring avian tuberculosis in a large percentage of the cases; (5) calves associating with tuberculous chickens sometimes reacted to the test for avian tuberculosis; (6) calves injected with the virus of avian tuberculosis reacted prominently and showed lesions of tuberculosis; (7) a benign type of tuberculosis in the lymph glands from cattle slaughtered at the Chicago market was found to be the avian type of the disease; and (8) the avian type was communicated to healthy pigs by association with infected swine. Avian tubercle bacilli were found in the feces of reacting pigs upon several occasions. Thus, sows infected with avian tuberculosis may be looked upon as a potential means of spreading the disease to pigs. In a total of 56 fecal specimens from 6 different pigs that had been infected with avian tuberculosis by contact with chickens over a period of 1 year, 25 per cent proved positive to the virus of avian tuberculosis upon test by animal inoculation.

Graham, Tunnicliff, and McCulloch found the inflammatory condition of the vulva and vagina in young pigs, many inquiries regarding which were received at the station, to be due to the spoiled feed given the pigs, and they successfully demonstrated that the trouble can be prevented by supplying wholesome rations and pure water. This is thought to be the first time the affection has been reproduced in experimental pigs by feeding damaged corn. A watery extract of the inferior corn produced mild symptoms of the disease. The observations made suggest that the animals that have suffered from vulvovaginitis accompanied by prolapse should be marketed and not saved for breeding purposes.

Immunizing young pigs against hog cholera, V, J. W. Benner (*N. Y. State Vet. Col. Rpt. 1926–27, pp. 119–130*).—This is a report of work conducted in connection with that noted from another source (E. S. R., 59, p. 475). Pigs vaccinated by the simultaneous method at 3 weeks of age were found to be solidly immune at ages varying from 7 months and 11 days to 9 months and 7 days.

The lymphatic system of the horse, H. Baum (*Das Lymphgefässystem des Pferdes. Berlin: Julius Springer, 1928, pp. X+135, pls. 20*).—Part 1 of this work (pp. 1–5) consists of a brief general discussion, part 2 (pp. 6–32) dealing with the lymph glands, and part 3 (pp. 33–131) with the lymph vessels.

Horses protected with toxoids for first time (*Illinois Sta. Rpt. 1928, pp. 160, 161*).—Investigations were made by R. Graham, E. A. Tunnicliff, and E. C. McCulloch to determine the efficiency of formolized botulism toxin as an immunizing agent in the horse and mule. The investigations included the three types of *Clostridium botulinum* poisoning designated as A, B, and C. It was found that formalin in the amount of 0.5 to 0.6 per cent added to filtered or unfiltered liquid cultures of *C. botulinum* B and C upon incubating one or more weeks at 37 to 42° C. becomes sterile and relatively atoxic. Type A toxin is apparently not completely detoxified as rapidly as B and C, though some other factors may be involved in preparing an efficient type A toxoid. A single subcutaneous injection of 1 to 3 cc. of atoxic botulism toxins A, B, and C has immunizing value for guinea pigs. Horses and mules were not protected by single injections of 20 to 30 cc. of botulism toxoids A, B, and C, but two injections a week apart protected against the unaltered toxins.

The intravenous administration of oil of chenopodium to horses, A. A. Pryer (*Vet. Jour., 84 (1928), No. 639, pp. 457–461*).—The author finds that undiluted oil of chenopodium can be introduced into the jugular vein of horses without undue sequelae. A dose of 5 cc. in one case and 7.5 cc. in another failed to produce any constitutional disturbance when given to horses of approximately 900 lbs. body weight, but in a third case the administration of 7.5 cc. to an animal of the same body weight produced transient restlessness. In a fourth case the administration of 10 cc. to an animal of the same body weight evoked delirium.

From the results obtained it is concluded that the anthelmintic value of oil of chenopodium, when administered to horses intravenously, is low if not actually negative.

[Poultry disease studies of the Illinois Station] (*Illinois Sta. Rpt. 1928, pp. 162–167, fig. 1*).—Further work (E. S. R., 58, p. 371) was conducted by R. Graham, E. A. Tunnicliff, and E. C. McCulloch with the intradermal or pullorin test for bacillary white diarrhea of fowls. Fifteen experimental powdered pullorins were used in testing 1,137 chickens, of which 367 reacted to the agglutination test and 581 to the pullorin test. Of the agglutination reactors 77.9 per cent were detected by the intradermal test, with a complete agreement of the two tests in 66.9 per cent.

The time and expense involved in preparing powdered pullorins prompted an effort to test the potency of liquid culture pullorins in different concentrations, cultures grown at 37° C. being killed by heating at from 60 to 65° for one hour or more. The experimental pullorins prepared by growing *Salmonella pullorum* in either Uskinsky's synthetic media or beef-extract broth seemed less reliable than with the powdered or chicken meat-mash pullorins.

Further developments in the genetic studies of the resistance of chicks to bacillary white diarrhea by E. Roberts and L. E. Card (E. S. R., 58, p. 372) are briefly reported upon. As the result of the four years' work, the existence of hereditary resistance is said to be supported by (1) consistent difference in survival between selected and unselected lines; (2) higher survival among inbred than among noninbred flocks; and (3) consistent performance of individuals during successive years on the basis of survival of progeny.

Bronchospirochetosis in the fowl [trans. title], **P. Krage and F. Weisgerber** (*Centbl. Bakt.* [etc.], *1. Abt., Orig., 102 (1927), No. 1–3, pp. 60–67, pl. 1*).—The author finds that the fowl may be affected with a bronchospirochetosis that clinically, patho-anatomically, and histologically is a fibrinous inflammation of the mucous membrane of the upper respiratory tract and bronchi. It is caused by a spirochete resembling *Treponema morsus muris* that appears in two separate forms. This spirochete also occurs as a saprophyte in the pharyngeal cavity of healthy fowls.

On the plurality of the diphthero-variola virus of poultry.—Immunity [trans. title], J. LAHAYE (*Ann. Méd. Vét., 73 (1928), No. 7, pp. 297–302*).—This is a further discussion (E. S. R., 57, p. 281; 58, p. 281), in which it is pointed out that pigeon pox and fowl pox are caused by viruses distinct from each other but possessed of very marked affinities. It is shown that the virus of pigeon pox may be employed in vaccinating against fowl pox, and that experimental work with some 30 subjects indicates that when thus treated a solid immunity is acquired by the fowl both to pigeon pox and fowl pox. Its use for this purpose is supported by the fact that some of the fowl pox virus used by the author for vaccination in control work has given violent reactions. This immunizing property of the pigeon pox virus is analogous to that of vaccinia for man.

Experimental vaccination of birds with the avian type of B. C. G. against tuberculosis [trans. title], R. HARNACH (*Ann. Inst. Pasteur, 42 (1928), No. 4, pp. 383–393*).—In experiments conducted with B. C. G some satisfactory results were obtained in immunizing against a massive infection by ingestion—the usual portal of entry.

Bacillary white diarrhea in baby turkeys, E. A. HEWITT (*Cornell Vet., 18 (1928), No. 3, pp. 272–276*).—In this contribution from the Minnesota Experiment Station the author reports upon studies made of an organism identified as *Salmonella pullorum*, which caused the loss of all the baby poults in a flock in Minnesota. A tabulation by months of the cases of bacillary white diarrhea in poultry flocks diagnosed at the laboratory shows the infection to have increased very rapidly in that State since 1918.

Inoculation studies were conducted with the organism isolated from two small turkeys received at the laboratory for diagnosis May 28, 1927. Grown in the differentiating carbohydrates the organism was found to be typical of the aerogenic type of *S. pullorum*, giving acid and gas in dextrose, mannite, and galactose with no change in lactose, sucrose, maltose, dextrin, and dulcite. Cultures of this organism from each of the poults were injected into guinea pigs, rabbits, and chickens, the results of which are described. The organism isolated from poults was of low virulence for other animals, although it was probably the cause of the death of the guinea pig which died 10 days following its injection. It was learned that the two affected poults received had been hatched in an incubator that had previously been used for hatching baby chicks and that all the poults hatched out in the flock died.

The etiology of blackleg and methods of differentiating Clostridium chauvaei from other anaerobic organisms found in cases of blackleg, J. P. SCOTT (*Cornell Vet., 18 (1928), No. 3, pp. 259–271*).—In this contribution from the Kansas Experiment Station the author reports upon the studies of *C. chauvoei*, *C. septicus* (=*Vibrion septique*, *Bacterium oedematis maligni* in part), *C. welchii*, *C. novyi*, *C. sporogenes*, and *C. tertius*. During the past 10 years examinations have been made of more than 150 samples of material from cases of blackleg and diseases reported as blackleg. *C. chauvoei* either alone or associated with other organisms has been isolated. In a few instances in which the material was atypical or the history uncertain only *C. septicus* or *C. welchii* could be found, although there is a possibility that *C. chauvoei* was also present.

It was found that while *C. chauvoei* is the primary cause of blackleg, *C. septicus* and other anaerobes may be associated with it in the production of this disease in cattle. *C. chauvoei* is shown to be a different saccharolytic fermenting organism and comparatively susceptible to heat and drying. Its differentiation depends upon morphological and cultural characteristics and on the serum protection test. Ninety-nine strains of *C. chauvoei* obtained from the United States, England, Ireland, France, Switzerland, Germany, South Africa, Argentina, and Brazil were examined and found to be identical in all respects.

Parasites and parasitic disease in the California valley quail, E. C. O'Roke (*Calif. Fish and Game, 14* (*1928*), *No. 3, pp. 193–198, figs. 4*).—A decrease in the number of valley quail occurring in California led to the studies a progress report of which is here presented. They have resulted in the positive identification of a protozoan parasite of the genus Haemoproteus in the red blood corpuscles. The percentage of parasitized blood cells ran as high as 7 per cent, the most heavily parasitized birds being found anemic. The failure to find evidences of accident or of disease other than that caused by this parasite has led to the conclusion that a fatal case of natural infection with Haemoproteus in the valley quail has been discovered.

In the limited study conducted parasitized quail have been found in Napa, Contra Costa, Santa Clara, and Stanislaus Counties.

A study of the diseases of the cottontail, Sylvilagus floridanus (Miller), of New York State, C. A. Lueder (*N. Y. State Vet. Col. Rpt. 1926–27, pp. 164–182, figs. 9*).—In examinations made of 54 rabbits, 16.6 per cent were found affected with abscesses, 90.7 per cent were infested with cysts of the larvae of the *Cysticercus pisiformis*, 79.6 per cent were infested with either one or two species of tapeworms in the small intestines, and 13 per cent were infested with both species. Fleas were found infesting rabbits during all of the year except December, January, and February. While larvae of *Cuterebra cuniculi* were not found in any of the 54 rabbits examined, abscesses indicating that they had been present were observed in nine. A pure culture of nonhemolytic *Staphylococcus aureus* was isolated from each abscess. The five rabbits not showing cysts were all about 3 months of age.

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Illinois Station] (*Illinois Sta. Rpt. 1928, pp. 234–253, figs. 5*).—The progress results of experiments on the agricultural use of electricity, operation of a general purpose tractor, corn borer control by machinery, terracing, and combining practice (including tests with 29 combines and 11 threshing machines with wheat and oats and 11 combines with soy beans), are briefly reported.

It was found that where conditions favor the use of large teams, the hitches and methods of driving that have proved practical in grain-farming sections of the West and Northwest are also satisfactory under Illinois conditions.

In gas-engine lubrication studies there seemed to be a close relation between the ability of an oil to resist crank-case dilution and the number of hours it can be used in an engine.

In drainage experiments it was found that the tile laterals must be spaced reasonably close for quick drainage in the tight clay soils of southern Illinois. Tests of the use of heated air in corn drying showed that a drying temperature of 130° F. did not lower the germination percentage of the corn, but that a temperature between 140 and 150° materially decreased germination. For practical purposes in the drying of corn for livestock feeding there appears to be no objection to a drying temperature as high as 150°.

The elements of hydrology, A. F. Meyer (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, 2. ed., rev., pp. XV+522, figs. 313*).—This is the second revised edition of this book (E. S. R., 42, p. 681). It contains the following chapters: The atmosphere—its temperature, pressure, and circulation; water—its various states and their properties; precipitation—its occurrence and distribution; evaporation from water surfaces; evaporation from land areas; transpiration; deep seepage; run-off; stream-flow data; supplementing stream-flow data; modification of stream flow by storage; and note to teachers of hydrology.

Daily river stages at river gage stations on the principal rivers of the United States, H. C. Frankenfield (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 25 (1927), pp. II+184*).—This volume, containing data on the daily river stages for 1927, constitutes the twenty-fifth of a series of reports on the subject (E. S. R., 57, p. 776).

Surface water supply of Pacific slope basins in California, 1924 (*U. S. Geol. Survey, Water-Supply Paper 591 (1928), pp. VIII+448, fig. 1*).—This report, prepared in cooperation with the States of California and Oregon, presents the results of measurements of flow made on streams in the Pacific slope basins of California during the year ended September 30, 1924.

The water relations of Yakima Valley soil, C. S. Scofield and C. C. Wright (*Jour. Agr. Research [U. S.], 37 (1928), No. 2, pp. 65–85*).—Studies conducted by the U. S. D. A. Bureau of Plant Industry with sandy loam soil having a moisture equivalent of about 16 per cent are reported. When the soil was irrigated it was found to hold about 16 in. of water in the first 6 ft. When the available supply of water was absorbed, as by a crop of alfalfa, it still contained about 5 in. of water in the first 6 ft.

"The indications are that when the soil contains less water than its field-carrying capacity, the loss of water by vaporization takes place not only at the soil surface but also well down in the soil. It seems probable also that the movement of water through the soil in the direction of establishing conditions of moisture equilibrium, when the moisture content is below the field-carrying capacity, takes place not so much by capillarity as by vaporization and subsequent condensation.

"With this soil, at least, the proportion of water available to crop plants (i. e., to alfalfa) is about 70 per cent of the field-carrying capacity, rather than about 45 per cent, as would be inferred by computing the wilting coefficient from the moisture equivalent. In order to leach the root zone and thus remove the highly soluble salts brought in by the irrigation water, it is necessary to apply more water than is customarily used to supply the needs of crop plants. If the irrigation water is salty, the root zone must be leached more frequently than when purer water is used."

An apparatus for adding gypsum to irrigation water, C. S. Scofield and E. W. Knight (*U. S. Dept. Agr. Circ. 38 (1928), pp. 6, figs. 2*).—A description is given of a device for adding gypsum to irrigation water. It is made chiefly of galvanized sheet iron and consists of a hopper, a revolving feeding device, a submerged stirring device, and a paddle wheel driven by the irrigation stream to actuate the feeding and stirring devices. The results of tests of the machine are also recorded.

Chlorinated copperas—a new coagulant, L. L. Hedgepeth and N. C. and W. C. Olsen (*Jour. Amer. Water Works Assoc., 20 (1928), No. 4, pp. 467–472*).—Experiments are reported which showed that ferrous sulfate and lime were not satisfactory coagulants unless the ferrous sulfate was oxidized to the ferric state. Prechlorination with reasonable doses did not improve the coagulation of highly colored water when applied in the mixing chamber, and reduced the tendency of the sludge in the coagulation basins to ferment. Copperas, completely oxidized with chlorine in the ratio of 1 part of chlorine to 7.8 parts of copperas, produced a coagulant superior to alum in color removal qualities and more economical because of its higher efficiency. A combination of chlorinated copperas, alum, and lime or sodium aluminate produced an attractive and economical filtered water.

Cost studies in clearing limestone land, H. B. Josephson (*Agr. Engin., 9 (1928), No. 9, pp. 275, 276, figs. 4*).—Experiments conducted at the Pennsylvania Experiment Station on the cost of clearing land of rocks by drilling and blasting are reported. The cost was $1.72 per cubic yard of rock removed where the rocks were drilled and $1.95 per cubic yard where no drilling was done, indicating the practicability of drilling large rocks.

Public Roads, [September, 1928] (*U. S. Dept. Agr., Public Roads, 9 (1928), No. 7, pp. 129–152+[2], figs. 22*).—This number of this periodical contains the status of Federal aid highway construction as of August 31, 1928, together with the following articles: A Study of Highway Traffic in the Cleveland Regional Area (pp. 129–138, 152); Field Experiments in the Curing of Concrete Pavements, by F. H. Jackson and G. Werner (pp. 139–145); Relation Between the Standard Abrasion Tests for Stone and Gravel, by D. O. Woolf (pp. 146, 147, 152); and Strength Characteristics of Concrete as Indicated by Core Tests, by A. N. Johnson (pp. 148–152).

Colorado pavement and subgrade studies, O. V. Adams and J. G. Rose (*Colorado Sta. Bul. 330 (1928), pp. 69, pls. 2, figs. 15*).—The results of a large number of studies, conducted in cooperation with the U. S. D. A. Bureau of Public Roads, are reported which indicate that sand cushions and granular layers of subgrade treatment should be provided with means of lateral drainage. Hair checks are a source of weakness in a pavement which is apt to result in further deterioration. Pavement cracks have been found to be more closely associated with clay soils having a high moisture content. The amount and character of traffic and in some cases the character of aggregate used appear to be the most important factors affecting the wear of pavements. In general it has been found that the 28-day strength of field cylinders is a good indication of the ultimate strength of concrete as shown by drill cores. The mechanical analysis, moisture equivalent, and lineal shrinkage tests were fairly satisfactory for determining the qualities of soils, but the value of the vertical capillarity test is questionable.

A bibliography is included, together with appendixes describing methods for the preparation of soil samples and determining the moisture equivalent, capillary moisture. lineal shrinking percentage, and mechanical analysis of soils.

Cements, limes, and plasters, E. C. Eckel (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, 3. ed., pp. XXXIV+699, pls. 5, figs. 156*).—This is the third edition of this book (E. S. R., 48, p. 589), which presents information on cements. limes, and plasters and their materials, manufacture, and properties.

Shrinkage of boards of Douglas fir, western yellow pine, and the southern pines, E. C. Peck (*Amer. Lumberman, No. 2774 (1928), pp. 52–54, figs. 7*).—Results of studies conducted by the U. S. D. A. Forest Service are briefly reported in graphic form. Special attention is drawn to the data on the relation of moisture content to shrinkage in longleaf pine, shortleaf and loblolly pine, western yellow pine, and coast Douglas fir. They show that the shrinkage rate is low at first, then high, and then low again, and that it is highest in the general vicinity of a moisture content of 12 per cent. In most cases the data indicate a slight shrinkage of the piece as an entirety before the average moisture content reaches the fiber saturation point.

The total radial shrinkage is approximately 75 per cent of the tangential shrinkage. The range in tangential shrinkage is from 5.5 per cent in both heartwood and sapwood of western yellow pine to 7.2 per cent in longleaf heartwood. The range in radial shrinkage is from 3.9 per cent in western yellow pine sapwood to 5.4 per cent in longleaf sapwood.

The possibilities of power alcohol and certain other fuels in Australia, G. A. Cook (*Aust. Council Sci. and Indus. Research Bul. 33* (*1927*), *pp. 106*).—This study brings out the fact that, as regards fermentation power alcohol, Australia appears to be in much the same position as most other countries in that the necessary raw materials are in general too valuable as foodstuffs to permit of their use for distillation. It appears, however, that in certain parts of Australia raw materials could be produced at such a cost as would enable any alcohol distilled from them to compete with gasoline, particularly if such alcohol were marketed in the areas of production.

This consideration of the cost of raw materials applies more to cereals than to tubers. In fact, in some Australian localities the fermentation of certain varieties of tubers is commercially attractive. Cassava, arrowroot, sweet potatoes, and beets are worthy of consideration in this connection. It is thought questionable whether fermentation alcohol can completely solve the national fuel problem.

As regards synthetic methods, it appears that neither the ethylene nor the acetylene processes have much hope of commercial success in Australia.

A study of substitute fuels for gas engines, P. R. Carreon (*Agr. Engin.*, *9* (*1928*), *No. 9*, *pp. 289–291*, *figs. 6*).—Studies conducted at the California Experiment Station on the use of commercial alcohol mixed with either gasoline or kerosene as fuel for gas engines are reported.

The results indicate that most farm gas engines on the present American market operating with gasoline or kerosene can be run with mixtures of gasoline and alcohol without structural changes. Many engines designed for using either gasoline or kerosene can, without material alteration, be adapted to the mixture of alcohol and kerosene. The total fuel consumption per horsepower hour, by weight, is less when using a mixture of alcohol and kerosene than when using kerosene alone except in the case of engines with very low compression ratios. In order to use mixtures of kerosene and alcohol it is necessary to have a carburetor with two fuel needle valves and jets.

The mixture of gasoline and 190 proof alcohol, as it forms a miscible mixture to the extent of 1:2 ratio at 70° F., can be readily used in places where alcohol is a cheaper fuel than gasoline. The engine tested started easily with the mixture of gasoline and 190 proof alcohol with a ratio as low as 1 part of gasoline to 10 parts of alcohol and with a room temperature of about 60°. To secure economical results it was necessary to keep the circulating water as hot as possible, and to advance the ignition timing as the percentage of alcohol in the mixture was increased.

The mixture of alcohol with either gasoline or kerosene exhibited less tendency to deposit carbon in the cylinder than either kerosene or gasoline and also less tendency to dilute the oil. The engine ran smoother on the mixtures of alcohol with either kerosene or gasoline than when operated on gasoline or kerosene alone. A bibliography is included.

Some power problems of the farm, J. M. Smith (*Alberta Univ., Col. Agr. Bul 17* (*1928*), *pp. 40*, *figs. 24*).—An outline is given of power problems of the farm, including discussions of horsepower, brake and drawbar horsepower, sizes and speeds of pulleys, and belt lacing.

Measured pulling power of many teams studied (*Illinois Sta. Rpt. 1928, pp. 161, 162*).—Experiments by J. L. Edmonds and E. T. Robbins on the pulling power of 260 teams, using a Collins dynamometer, showed that massive build, energetic but calm disposition, and steady driving are the main factors in success in pulling.

Tests of tractor wheel equipment, H. B. Josephson (*Agr. Engin., 9 (1928), No. 10, pp. 313–315, figs. 4*).—Experiments conducted at the Pennsylvania Experiment Station are reported. The results showed that rubber-tired wheels without chains provided sufficient traction for general field work, other than plowing, only under the most favorable conditions. A little moisture on the surface caused the wheels to spin. The tractor equipped with rubber-tired drivewheels and metal front wheels was driven at 4 miles per hour over rocky farm roads with perfect comfort to the operator. Rubber-tired front wheels made steering difficult and were not necessary for purposes of securing easy riding. The ground appeared to be packed more by rubber-tired wheels than by any metal wheels used.

Spade lugs on an 11-in. rim gave by far the best traction of all wheels tested, both on plowed ground and in sod. Angle lugs on a 6-in. rim gave very nearly the same traction as the open wheel with cone lugs. The open wheel without lugs worked well for light hauling; the tractor rode smoothly but traction was limited. The solid rims with angle lugs were conveniently attached to this wheel for field work.

The harvesting of cornstalks, J. B. Davidson and E. V. Collins (*Agr. Engin., 9 (1928), No. 10, pp. 301, 302, figs. 2*).—The results of studies conducted at the Iowa Experiment Station on the harvesting of cornstalks for industrial use are reported, which indicate that with efficient organization and management cornstalks may be collected at a practical cost and in sufficient quantity to meet factory demands.

Electro-farming, R. B. Matthews (*London: Ernest Benn, 1928, pp. XVII+357, figs. [162]*).—This book is based on British experience in the use of electricity in agricultural practices. It contains chapters on electrofarming; the power station and the agricultural load; private electric generating plants; agricultural electric motor drives; systems of overhead transmission; electrofarming in other countries; rural industries; wiring and lighting of farm buildings; electric plowing; harvesting; handling crops; threshing; electrosilage; electroculture and light treatment; irrigation, pumping, and liquid manure distribution; electricity on the poultry farm; electricity on the dairy farm; bees; and applications of electricity in the homestead.

Grinding feed with electric power, F. J. Zink (*Agr. Engin., 9 (1928), No. 10, pp. 307, 308, fig. 1*).—The results of studies conducted at the Iowa Experiment Station are briefly reported, showing that "the farmer who needs only one or two hundred bu. ground annually should have it done at a custom mill if within a reasonable hauling distance. A farmer requiring more than 400 bu. ground per year can well afford to own his own equipment and do the grinding work on his farm. Home grinding costs approximately one-half that of custom-mill grinding when more than 700 bu. are ground annually. Of the two types of home grinding the small mill will operate from 25 to 35 per cent cheaper than the large equipment. . . . From all points of view, when improved for automatic or semiautomatic operation the small equipment is superior to the larger equipment. It is cheaper to operate, a lower capacity transformer may be used, it gives a greatly improved load factor, and aids in the improvement of the demand and diversity factors of rural distribution lines."

Electric heating, E. A. Wilcox (*New York and London: McGraw-Hill Book Co., 1928, pp. VIII+469, figs. 152*).—This book contains chapters on fundamentals of heat; electrical fundamentals; resistor elements and heating units; cooking; water heating; air heating; oven heating; heating furnaces; iron- and steel-melting furnaces; brass-melting furnaces; high-frequency furnaces; pot furnaces; miscellaneous furnace applications; arc welding; resistance welding; metal heaters; sterilizers, stills, and steam boilers; liquid heating and compound melting pots; incubators and brooders; miscellaneous heating appliances; metal coatings; temperature measurement and control; and thermal insulation.

The unit space method of barn planning, D. G. CARTER (*Agr. Engin., 9 (1928), No. 9, pp. 271-273, figs. 7*).—A space unit method of barn planning developed at the Arkansas Experiment Station is described.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in farm organization and management and agricultural economics at the Illinois Station, 1927-28] (*Illinois Sta. Rpt. 1928, pp. 195-233, figs. 9*).—The results of investigations not previously noted are reported as follows:

[*Farm organization and management*, H. C. M. Case and M. L. Mosher] (pp. 195-199).—Tables are given summarizing the 1927 records and important factors affecting the earnings on 200 of the 239 farms in the cooperative farm bureau-farm management service project, previously noted (E. S. R., 58, p. 379).

[*Farm earnings*, H. C. M. Case, R. R. Hudelson, and H. A. Berg] (pp. 199-209.)—Records and accounts kept in 1927 on 1,102 farms under the project previously noted (E. S. R., 58, p. 379) are summarized by 9 areas, consisting of from 1 to 4 counties, and a map is given showing by areas the computed earnings for farmers in 8 different farming-type areas of the State. The computed earnings from 1926 to 1927 changed as follows: Increased, grain farming area from 1.5 to 2 per cent, and wheat and dairying area 2.1 to 2.5 per cent; and decreased, dairying area from 2.9 to 2.7 per cent, mixed livestock area 3.6 to 1.6 per cent, beef and hog area 2.3 to 1.5 per cent, general farming (corn) area 2.3 to 1.6 per cent, general farming (wheat and corn) area 2.5 to 1.7 per cent, and mixed farming 4.3 to 1.6 per cent, averaging for the State 2.3 to 1.8 per cent.

The reasons for the increases and decreases in the different areas are discussed briefly.

[*Cost and profitableness of crops*, H. C. M. Case, R. H. Wilcox, J. B. Andrews, and H. A. Berg] (pp. 210-212).—The cost records for 1927 from 15 farms in Champaign and Piatt Counties and 17 Clinton County farms obtained in the study previously noted (E. S. R., 58, p. 379) are analyzed. The average net costs of different crops for the year were corn husked in the field 60 cts., oats 60 cts., winter wheat $1.17, and soy beans threshed $1.69 per bushel, and clover and mixed hay $12.82 per ton. Corn husked in the field and winter wheat showed $3.91 and $1.30 profit per acre, respectively; and oats, soy beans threshed, and clover and mixed hay showed losses per acre of $6.32, $7.63, and $8.90, respectively.

[*Costs and power needs of combines, R. C. Ross and L. A. Reynoldson*] (pp. 213-215).—Records were secured on 77 combines located in 24 counties. The season's costs for cutting and threshing, not including hauling the grain, for different sizes and types of machines were as follows: Power take-off type, 8-ft. machines $356.89 for 194 acres, and 10-ft. machines $496.18 for 297 acres; and motor-mounted type, 9-ft. machines $500.72 for 248 acres, 10-ft. machines $561.60 for 284 acres, 12-ft. machines $673.81 for 322 acres, and 16-ft. machines $815.12 for 450 acres. Of the total cost, from 21 to 26 per cent was labor, 15 to

23 per cent power, 24 to 34 per cent depreciation, about 12 per cent lubricants, 7 to 10 per cent interest, about 5 per cent repairs, and 2 per cent shelter. The total cost of cutting and threshing averaged approximately $2 per acre for wheat, oats, and barley, and nearly $2.25 for soy beans.

[*Pork production costs*, R. H. Wilcox and H. P. Rusk] (pp. 215, 216).—The final year's data on the project previously noted (E. S. R., 58, p. 380) were completed. The results for the 3 years showed that pigs farrowed during the late spring and early summer required 10 lbs. more grain and 4 lbs. less protein feeds, and fall pigs 4 lbs. less grain and 3 lbs. less protein feeds to produce 100 lbs. of pork than did the early spring pigs. The late spring pigs were marketed at an average weight of 237 lbs., and the early spring pigs at an average weight of 207 lbs. Farms with only tried sows in their spring breeding herds averaged 6.1 pigs weaned per sow, as compared with 5 7 pigs on farms using only gilts. The average cost of producing 100 lbs. of pork was $11.14 for pigs weaned in litters of less than 4, and $8.39 for those in litters of over 6 pigs.

[*Costs of producing milk*, H. C. M. Case, K. T. Wright, and C. S. Rhode] (pp. 216–218).—The costs of production per 100 lbs. of milk varied from $1.56 to $3.18 on 60 farms studied. On 36 farms located near Chicago, the average total costs per 100 lbs. of milk were $1.81, $2 09, $2 32, and $2.30, and the average profits per cow $83.40, $54.22, $51.41, and $42.57 for the groups of 9 cows each, with an average yearly production of 9,743, 8,003, 7,227, and 6,303 lbs. Feed averaged 51 per cent, man labor 21.6 per cent, depreciation 10.6 per cent, and other costs 16.8 per cent of the total cost of production for all the herds.

[*Marketing soy beans*, C. L. Stewart, O. L. Whalin, and L. F. Rickey] (pp. 219–221).—Some of the new problems arising from the approximately 613,000-bu. increase in the production of soy beans are discussed.

[*Financial operations of elevators*, C. L. Stewart, L. J. Norton, and L. F. Rickey] (pp. 222–225).—Replies by 471 farmers to a questionnaire relative to farm storage facilities and practices showed that more adequate farm storage would have made possible slower marketing of grain one-seventh of the time in the State as a whole, and one-fifth of the time in eastern Illinois. More available credit would have delayed marketing about one-fifth of the time in the State as a whole and about one-third of the time in the eastern and central parts of the State.

A study of the audit reports of 56 companies for the year ended December 31, 1925, showed that 23 failed to pay expenses, including interest on money borrowed and depreciation, 16 of the failures being due to inadequate grain income, 3 to inadequate merchandise income, and 4 to excessive expenses. The average expense of the 56 companies was 4.54 per cent of the sales in dollars, of which 37.2 per cent was for labor and management, 24.4 per cent for property expense, 11.2 per cent for business expense, 10.7 per cent for interest paid, and 16.4 per cent for interest at 7 per cent on net worth.

[*Price studies*, L. J. Norton] (pp. 225–229).—A graph, prepared by B. B. Wilson, is given showing the yearly prices of hogs from 1866 to 1927.

A graph is also given showing for each of 14 farm products the average prices in 1922–1926 and in 1927 in percentages of the average prices for the period 1910–1914, and the factors affecting the probable permanency of the changes are set forth briefly.

A graph showing the relative production per capita in the United States and prices paid farmers for 11 important sources of food combined is also included.

[*Land tenure*, C. L. Stewart] (pp. 230–233).—An analysis is made of the data of the 1925 Federal agricultural census. Tenants in Illinois operated 51.4 per cent of the harvested crop land and 39.3 per cent of other land in farms. Part owners operated 14.5 per cent of the farms, 17.7 per cent of the crop land, and 16.6 per cent of the noncrop land, and managers 1.3 per cent and 1.8 per cent, respectively, of the crop and noncrop land. The percentage varied greatly in different sections, that for managers in Lake County being 12.2 per cent, and that for part-time owners being higher than that for full tenants in 8 counties in southern Illinois and for that of full owners in 5 counties in southern and 4 counties in the central part of the State. While full tenants operated 63.5 per cent of the total crop land harvested by full tenants and full owners, that percentage was exceeded in 5 counties in southern and 10 counties in northern Illinois and 29 counties in central Illinois, and in 14 counties the percentage was about 75 per cent. The percentage of cash tenants related to land owners by blood or marriage was less than 10 per cent in 7 counties, and that of share and share-cash tenants varied from 7.4 per cent in one county to over 45 per cent in 4 counties.

Tenants purchased on an average $12 worth of supplies and made $258 worth of sales per capita through cooperative organizations, as compared with $14 and $214, respectively, for full owners and part owners combined.

[**Investigations in agricultural economics at the Kentucky Station, 1927**] (*Kentucky Sta. Rpt. 1927, pt. 1, pp. 8–12, 21*).—Results of investigations are reported as follows:

Factors for profitable farming.—An analysis of 163 representative farms in Green, Taylor, and Adair Counties for the year ended March 1, 1927, showed that the 25 least profitable farms made an average of 2 per cent on the investment, after paying all expenses and allowing $193 per farm for operator's labor, while the 25 most profitable farms made 17.6 per cent. Better livestock, better cropping systems, higher crop yields, better balance between crops and livestock, larger receipts, more effective spending, and size of business were the chief factors affecting the size of profits.

Cost of production studies in central Kentucky.—An analysis of the cost and returns of crops for 1921 to 1926 on representative farms showed that man labor per bushel of corn grown and harvested varied from 0.58 to 1.3 hours on different farms. Yield per acre, size of implements, size of fields, and the extent to which work was planned, scheduled, and dispatched were the chief causes of the differences.

Business analysis of Christian County farms.—A study of 56 farms in Christian and Todd Counties showed that on the 12 most profitable farms the average net return was 100 per cent higher and the return on capital invested 50 per cent higher than the average for the 56 farms. The average expense per $1 of income was 54 cts. on the more successful farms and 71 cts. on the 56 farms. Utilization of labor and income from livestock were the major factors affecting profits.

Farm tenancy studies.—Comparison of average earnings of 55 tenants on tobacco farms in Fayette County in 1924 and 1926 showed that the average net earnings, including things furnished by the farm and rent on tenant house, decreased from $1,051.18 to $628.16. The chief cause of the decrease was the decline in the receipts per acre from tobacco, being from $112.24 to $60.87, due chiefly to the decline in price. Data regarding 176 landlords for the same years showed that return on investment and rent per acre received declined from 12.11 per cent and $24 to 7.5 per cent and $11.50.

A study of the attendance records of 19 rural white grade schools, 2 high schools, and 5 colored schools showed that the total average enrollments for the 9 school months were 1,214.55, 86, and 306.22, respectively; total number of pupils leaving school during the year 527, 26, and 26; total new enrollments during the year 416, 6, and 29; total number of pupils leaving school during the tenant moving period 294, 14, and 10; and the total number of pupils enrolling during the tenant moving period 199, 5, and 7, respectively.

[*Poultry marketing.*]—A study covering farm prices for 15 years showed that the price in the United States of turkeys has averaged nearly 1.5 cts. per pound higher in December than in November. The November price was exceeded by 1 ct. or more by the December price in 10 years and by the January price in 8 years. There was a slight tendency for capon prices to be high during the first part of January, lower until the latter part of March, and then higher again. For the last 7 years the average prices per pound in New York City for dressed capons of different weights were, 10-lb. capon, 47.3 cts.; 8-lb., 44.4 cts.; and 5-lb., 35.8 cts.

Profitable farming systems for the intensive spring wheat area in South Dakota, C. A. Bonnen and R. H. Rogers (*South Dakota Sta. Bul. 235* (*1928*), *pp. 48, figs. 17*).—This bulletin reports the results of the second study in the series previously noted (E. S. R., 58, p. 186), having for its object the determination of the systems of farming likely to give the best results in the principal type-of-farming areas in the State. The work was done in cooperation with the Bureau of Agricultural Economics, U. S. D. A., and the data were collected from 20 farms in Brown County during the years 1925 and 1926.

Tables are given showing the relative prices for crops and livestock products over a period of years, the standard yields and material requirements for crop production, and standard feed and labor requirements for livestock and for milch cows, and comparisons are made of the organization, operation, returns, labor income, labor requirements, etc., for 240-, 320-, and 480-acre farms organized according to actual and suggested systems.

Taxation and public finance in South Dakota, E. P. Crossen (*South Dakota Sta. Bul. 232* (*1928*), *pp. 76, figs. 6*).—The sources and amounts of State, county, township, municipality, and school district revenues; the methods of levying and collecting the general property taxes; the State, county, township, municipality, and school district expenditures for different purposes; the State, county, school district, and municipal indebtedness; and the fiscal administration in the State are described and discussed.

The results are presented of a detailed study, made in 5 representative counties of the State, of the relation of taxes to net income from farm and city property. The data were obtained by enumerators from farmers and property holders, real estate operators, banks, and holding corporations of banks. The percentages of net rent paid in general property taxes in the years 1919 to 1926, inclusive, varied from 7.4 to 120 per cent, and the 8-year averages for the different counties varied from 21.9 to 40.1 per cent on farm lands. On rented city real estate the taxes other than city taxes varied from 12.6 to 26.3 per cent of the net incomes, and the 8-year averages for the different counties varied from 16.1 to 20.3 per cent. The average percentages for the 8-year period of the property taxes on farm real estate levied by the different taxing units varied in the 5 counties, as follows: State taxes from 9.1 to 20.2, averaging 15.9 per cent; county taxes, 28.1 to 55.8, averaging 33.3 per cent; and township and school district taxes, 35.1 to 51.7, averaging 50.8 per cent. Those of the property taxes on city real estate other than taxes levied by the city varied as followed: State from 6.5 to 10.2, averaging 8.5 per cent; county, 11.9 to 33.8, averaging 23.6 per cent; and municipality, 59.7 to 79, averaging 67.9 per cent.

The factors to be considered in formulating tax policies are also discussed. The study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

Major transactions in the 1926 December wheat future, J. W. T. Duvel and G. W. Hoffman (*U. S. Dept. Agr., Tech. Bul. 79 (1928), pp 52, pls. 2, figs. 8*).—This bulletin is the third of the series previously noted (E. S. R., 57, p. 86), and carries the analysis from June 1 to December 31, 1926. It deals primarily with transactions in the 1926 December future, but transactions in the 1926 July and September and in the 1927 May futures are also included. The prices and trading during the summer and fall of 1926; the market position of 42 large speculators; the net position of small traders, being the customers of 15 clearing firms of the Chicago Board of Trade, and of 22 hedging accounts compared with price; and the net position and net trades of 5 leading speculators are analyzed and discussed.

The relationship of the net position of the 42 large speculators at the close of the market each day and the closing price of the appropriate future showed a correlation coefficient of +0.71, and that of the small trader a coefficient of —0.83. The coefficient in the case of the 5 largest speculators who at some time during the period covered were long or short over 2,000,000 bu. was +0.72. The price moved in the same direction as the net trades of the 5 leading speculators on 68 per cent of the days when that group traded to a net amount of 500,000 bu. or more, on 79 per cent of the days when the group had net trades of 1,000,000 bu. or over, on 86 per cent of the days when the group's net trades were 2,000,000 bu. or over, and on each day when its net trades were over 5,000,000 bu.

Market destinations of Illinois grain, C. L. Stewart, L. J. Norton, and L. F. Rickey (*Illinois Sta. Bul. 315 (1928), pp. 61–115, figs. 10*).—This bulletin is based on an analysis of the shipping records of about 350 Illinois elevators for July, 1923, to June, 1925, and about 175 elevators for the year July, 1925, to June, 1926. Tables and graphs are included showing the proportion of shipments of corn, oats, and wheat from the northern, central, southern, and western districts of the State to different markets. Transportation rates and other costs affecting the choice of markets in the different districts and the changes in markets from 1912 to 1917 and from 1923 to 1926 are included.

Comparisons of the pre-war and post-war distribution of grain for a belt of counties across the central part of the State showed that the percentages going to Chicago declined from 51 to 17 for oats, 38 to 23 for corn, and from 70 to 64 for wheat. The largest increases were Decatur from 4 to 22 per cent for corn, St. Louis from 8 to 23 per cent and southern points other than Memphis and Indiana points other than Indianapolis from 2 to 9 per cent for oats, and Illinois mills from less than 1 to 4 per cent for wheat.

No marked differences were found in the markets used by farmers' elevators or privately owned elevators.

South Dakota potatoes: Production, prices, destinations, V. R. Wertz (*South Dakota Sta. Bul. 234 (1928), pp. 40, figs. 28*).—Tables and graphs are presented and discussed showing for the United States and South Dakota the location of the potato-producing areas, the yield per acre, and the trend of production, 1890–1924; for the 26 late-crop States and South Dakota the relationships between production, farm price, and farm value and between farm price and farm value one year and the acreage planted the following year; and for

South Dakota the surplus and deficit potato counties, destination of surplus potatoes, freight rates to Chicago and Kansas City compared with competing sections, and the cost of producing potatoes compared with competing sections. Some of the economic conditions affecting the profitableness of potato growing and the monthly prices in primary markets are also discussed.

The freight rates to Chicago and Kansas City place South Dakota in a fairly favorable position to compete with other States. A comparison of man and horse hour requirements to produce potatoes in five of the principal late-crop potato States of the Northwest showed the former to be the lowest and the latter next to the lowest in South Dakota. In South Dakota, as in the main late-crop States, a year of farm value of potatoes above normal was followed the next year by an acreage above normal, and vice versa. The farm value of the potato crop in South Dakota was found to have been increased as often by high production as by low production, while in the 26 important late-crop States the production above normal has usually reduced farm value below normal.

Marketing live broilers in New York City, H. I. Richards, M. F. Abell, and E. H. Rinear (*New Hampshire Sta. Bul. 234* (*1928*), *pp. 31, figs. 12*).—This bulletin reports the results of two studies, an analysis of live broiler receipts and prices on the New York market, by Richards and Abell, and a study of the cost of marketing New Hampshire broilers, by Rinear.

The first study was based upon data obtained from the books of 12 New York City poultry dealers and shows the weights and prices paid for shipments from different States on different days of the periods covered. The records of 7 companies covered the period January 1, 1925, to May 31, 1927, those of one company going back to November 1, 1923. The records of the other 5 companies covered shorter periods.

Tables and graphs are included showing the monthly and weekly receipts of live broilers from January, 1925, to May, 1927, inclusive, from New Hampshire and other groups of competing States; the monthly average price from January, 1925, to May, 1927, inclusive, of live broilers; and the top Thursday quotations from January, 1921, to May, 1927, inclusive, for Long Island ducks, express fowl, and "broilers," "colored broilers," or "chicken broilers." The trends in receipts and prices and the percentages of receipts by months and by days of the week are analyzed and discussed, with special reference to the New Hampshire industry.

The second study is based on records from 18 New Hampshire shippers representing 265 express shipments, totaling 135,495 lbs., made from May 5, 1923, to May 24, 1928, to New York City. The average marketing costs for the different shippers per pound of net billed weight varied from 4.82 to 9.1 cts., averaging 7.64 cts., for all shipments divided as follows: Shrinkage 2.45, coop 0.99, express 1.92, and commission 2.28 cts.

Marketing Kentucky eggs, D. G. Card (*Kentucky Sta. Bul. 283* (*1928*), *pp. 42, figs. 7*).—This bulletin consists chiefly of tables and graphs with discussions, based on data published by the U. S. Department of Agriculture and other Federal and State bureaus, State experiment stations, and trade journals, and covers for the United States, Kentucky, and districts of Kentucky the production of poultry and eggs, the receipts and prices of eggs in important markets, the average distribution by months of total egg receipts and receipts from Kentucky at New York City, the monthly average wholesale price of different grades of eggs at New York City, the average monthly spread between New York City wholesale prices for Fresh Firsts and Kentucky farm prices, the average monthly cold storage holdings in the United States, the average monthly farm prices in Kentucky and neighboring States, and the average monthly spread between the prices of fresh and cold storage eggs.

The methods of marketing and the principal market problems in Kentucky are discussed briefly, and some suggestions are made for possible improvements.

Index numbers of prices farmers pay for commodities purchased, C. M. Purves (*U. S. Dept. Agr., Bur. Agr. Econ., 1928, pp.* [*2*]+*24*).—This mimeographed report presents index numbers of prices paid by farmers for different groups of commodities bought for family maintenance—food, clothing, operating expenses, furniture and furnishings, and building materials for the house; for use in production—feed, machinery, fertilizer, building materials, equipment and supplies, and seed; and for wages paid, taxes, land values, and prices received for farm products. The index numbers are by years, 1910 to 1927, inclusive, and by quarters, January 15, 1923, to June 15, 1928, inclusive. The prices used were obtained by the Department from its price correspondents during the period included. The weightings of commodities in the groups and of the several groups are based upon data obtained in studies made by the Department, State agricultural experiment stations, the U. S. Bureau of Labor Statistics, the U. S. Bureau of the Census, and some private businesses. The method of constructing the index numbers is described.

As of June 15, 1928, "the power of the given quantity of farm products to purchase a quantity of commodities for farm use was about 93 per cent of prewar. . . . This is the highest purchasing power attained by farm products since 1920."

Equalizing library opportunities in South Dakota, W. F. Kumlien (*South Dakota Sta. Bul. 233* (*1928*), *pp. 31, figs. 12*).—The results are presented of a study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., of the public library facilities in South Dakota and the costs of and the use made of such facilities. The library conditions, public library agencies, and the library policy of the State are discussed.

The average per capita expenditure, number of volumes, and circulation in South Dakota in 1926 were 18 cts., 0.34 volumes, and 1.51 volumes, respectively, as compared with 33 cts., 0.62 volumes, and 2.13 volumes, respectively, for the United States. Excluding the 4 counties in which county libraries were maintained, only 3.2 per cent of the borrowers were country people. In the 3 counties maintaining active county library systems, there were 3,984 country and 3.840 town borrowers.

The text of the law pertaining to county libraries is included, and the organization and operation of the existing county libraries are described briefly.

The conclusions are reached that, except in towns of 4,000 population or over, satisfactory library facilities can not be supported by the town alone, but that probably 40 counties in the State could support a county library system at an annual cost of from 50 cts. to $1 per capita.

FOODS—HUMAN NUTRITION

Percentage yield of available meat from the cuts of yearling beef carcasses, C. Knostman and A. Mustard (*Jour. Home Econ., 20* (*1928*), *No. 7, pp. 502–506*).—Two sides of good and medium grade carcasses of yearling beef from both steers and heifers were divided into wholesale cuts according to Chicago methods and the wholesale cuts subdivided according to the method recommended for the National Cooperative Project on Meat. Records were kept of the total weight, boned or trimmed weight, weight after cooking by methods appropriate to the cut, and the number of servings obtained from each cut. The data obtained are reported in two tables, one giving the average percentage of weight of the total carcass of yearling beef appearing as shrinkage, waste, and available meat and the other the average number of servings per pound and the average weight of cooked servings and character of servings from cuts of yearling beef, including good and medium grades of steer and heifer. The following general deductions are made from these data:

"The proportion of available meat to total carcass varies with cut. Less than one-half of the total weight of the cuts of a carcass is available for serving. The weight and character of the serving depend upon the cut. A good grade in both steer and heifer carcasses is more desirable for use in the institution than a medium grade because a higher percentage of it is contained in the more valuable cuts and gives a higher yield of available meat."

Good flour produced from single wheat variety (*Illinois Sta. Rpt. 1928, pp. 301, 302, fig. 1*).—Further work on the baking qualities of Illinois wheat flours (E. S. R., 57, p. 591) has consisted chiefly in tests of single variety wheats. Two lots of Ilred wheat, one grown in the northern and one in the central portion of the State, and one lot of Fulcaster wheat, a typical soft wheat grown in the southern part of the State, were milled into an all middlings and a clear grade of flour, half of each grade being bleached and half left unbleached. Bread made from all of the samples was excellent in general appearance, flavor, and texture, demonstrating that each of these wheats yields a good all-purpose flour. Loaves from the Fulcaster flour were of somewhat smaller volume than those from the Ilred flour.

Studies of the effect on their bread-making properties of extracting flours with ether, A. H. JOHNSON (*Cereal Chem., 5 (1928), No. 3, pp. 169–180, figs. 2*).—Observations of Working (E. S. R., 52, p. 202) and others to the effect that lipoids either present in the flour or added to it impair the baking quality of the flour suggested the experimental work reported in this contribution from the Minnesota Experiment Station.

Nine flours of varying quality were extracted with ether, and breads prepared from both the extracted and nonextracted flour were compared for color, texture, and volume. Various tests were also made on the flours themselves.

The bread baked from the ether-extracted flour was in all cases of better color, texture, and volume than bread from the corresponding natural flour, the improvement in volume being particularly noticeable in the low-grade flour. No significant differences were noted in the absorption, the wet or dry gluten, and the viscosity of the extracted and natural flours. The extensibility of the extracted flours was slightly lower and the diastatic activity and content of reducing sugars higher than in the corresponding natural flour. Treatment of the flour with 70 per cent or 96 per cent alcohol lowered the bread-making quality of the flour, and treatment with water reduced the extensibility and viscosity.

The author is of the opinion that materials other than true fatty acid glycerides are responsible for the poorer quality of the bread baked from the natural than from the ether-extracted flour.

The action of phosphatides in bread dough, E. B. WORKING (*Cereal Chem., 5 (1928), No. 3, pp. 223–234, figs. 5*).—Experiments on artificial dough development are reported and discussed, with the conclusion that there are at least two distinct changes brought about in dough during the development of fermentation. One of these is the reduction of the tensile strength of the gluten strands caused by acid, and the other the increase in ductility of the dough caused by substances such as phosphatides through a lubricating effect on the gluten strands. It has been found that these two changes can be brought about by the addition of an acid and egg yolk or an oxidizing agent which will bring about the liberation of the phosphatides in the flour. In commercial practice lactic acid and sodium chlorate are recommended and in home practice buttermilk or sour milk and egg yolk. With the use of these materials it is said to be possible to produce finished bread or buns of the best quality two hours after the mixing is started.

Some factors influencing the absorption in experimental baking, J. Micka and E. Child (*Cereal Chem., 5 (1928), No. 3, pp. 208–214*).—Data are reported showing that the absorption capacity of a flour depends upon other factors than flour and water alone. The quantity of flour used in a dough was found not to alter appreciably the percentage absorption, but salt and yeast were found to increase, and lard and to a greater extent sugar to decrease, the absorption. High absorption is considered to be less favorable than low.

A study of " rope " in bread, E. A. Fisher and P. Halton (*Cereal Chem., 5 (1928), No. 3, pp. 192–208, figs. 4*).—Earlier work on the cause and prevention of rope in bread is reviewed, and experiments are reported in which various acids and acid salts were added to infected flour for the purpose of developing sufficient acidity in the loaf to inhibit rope development. Of the materials tested, which included acetic acid, lactic acid, tartaric acid, acid potassium phosphate, and acid calcium phosphate, the acid calcium phosphate was found to be the most effective. Practical recommendations to bakers for testing flours for rope organisms and for utilizing infected flour by the addition of acid calcium phosphate are included.

A volume measuring device for small loaves, W. F. Geddes and D. S. Binnington (*Cereal Chem., 5 (1928), No. 3, pp. 215–220, figs. 4*).—A detailed description, with working diagram, is given of an adaptation of the hourglass type of volume measuring device to an accuracy of from 2 to 3 cc. This is especially desirable for the measurement of loaves made with 100 gm. of flour and varying in volume from 400 to 500 cc.

The avocado in California, J. Dale and E. Stoddard (*West. Hosp. and Nurses' Rev., 12 (1928), No. 2, pp. 25–27, 48, 49, figs. 4*).—A popular article on the introduction of the avocado into the United States and its cultivation, composition, and nutritive value.

Foods and drugs, J. M. Bartlett (*Maine Sta. Off. Insp. 127 (1928), pp. 16*).—This is the annual tabulation of the results of the examination of food and drug samples collected by the division of inspections of the State department of agriculture (E. S. R., 57, p. 591).

The cooking of liver for the treatment of pernicious anemia, C. E. Pollock (*Lancet [London], 1928, II, No. 12, pp. 598, 599*).—A few general rules for cooking liver for use in pernicious anemia are given, together with several unusual recipes for furnishing variety in the serving of liver.

Breast milk—a variable food, I. G. Macy and J. Outhouse (*Jour. Amer. Dietet. Assoc., 4 (1928), No. 1, pp. 9–14*).—This discussion of the various factors which influence the quality and quantity of breast milk is based upon studies carried on at the nutrition research laboratories of the Merrill-Palmer school and the Children's Hospital of Michigan (E. S. R., 57, p. 390).

Factors influencing the excretion of calcium, B. Hamilton and M. Moriarty (*Amer. Jour. Diseases Children, 36 (1928), No. 3, pp. 450–462, figs. 2*).—A series of mineral metabolism experiments was conducted on a premature infant fed pooled breast milk, the object being to determine the relationship which may exist between the excretion of calcium in the stools and the intake of mineral substances in the milk.

A statistical study of the data obtained showed that of the various factors investigated the intake of total fixed base was the only one showing a definite relationship to the excretion of calcium in the stools. Calculations of the calcium in the stools from the fixed base intake showed, however, that the excretion was influenced to a lesser degree by the intake of calcium. It is thought probable that it is the buffer content of the milk which is responsible for the influence of the fixed base on calcium excretion. This supposition is confirmed by a few experiments in which acid and alkali were added to the milk.

The simplicity of infant feeding, McK. Marriott (*Jour. Amer. Dietet. Assoc., 4 (1928), No. 1, pp. 1–8*).—This is a general discussion of the requirements for infant feeding and of simple means of meeting these requirements by mixtures of cow's milk (either boiled or evaporated) and sugar (preferably Karo corn sirup), with or without lactic acid, and supplemented by cod-liver oil for vitamins A and D and orange juice for vitamin C.

Simplification of infant feeding (*Jour. Amer. Med. Assoc., 91 (1928), No. 9, pp. 646, 647*).—An editorial discussion of the above-noted paper by Marriott and a previous one by Powers (E. S. R., 54, p. 694).

The influence of sleep on basal metabolism of children, C. C. Wang and R. Kern (*Amer. Jour. Diseases Children, 36 (1928), No. 1, pp. 83–88, figs. 2*).—Data are reported on the basal metabolism during sleep of 5 boys and 7 girls from 4 to 10 years of age.

Compared with the results obtained in a previous study of the basal metabolism while awake of a similar group of children (E. S. R., 56, p. 395), as well as with observations on the same children of the present investigation while awake, the data show that the metabolism of children during sleep is decidedly lower than while awake. In 9 of the 12 children the differences amounted to more than 10 per cent. Neither age, sex, nor extent of undernutrition seemed to affect the degree of variation.

The values during sleep agreed much more closely with the Benedict standards than did the waking values. Although the number of children was too small to warrant definite conclusions, the data are considered significant enough to suggest the advisability of doing more work on standards for children, and particularly of extending the observations on children while awake in order to establish standards comparable with those for adults.

Permanent records of growth and nutrition of children, H. D. Clough and J. R. Murlin (*Amer. Jour. Diseases Children, 36 (1928), No. 3, pp. 425–433, figs. 4*).—Stereoscopic photographs taken at intervals under standardized conditions are recommended as furnishing permanent visual records of the growth and nutrition of children. By the use of a large plane mirror of plate glass placed at an angle of 45° to the mesial plane of the child, a reduced lateral view is also obtained. A surveyor's scale is photographed at the same time to show the scale of reduction. The technique of the standardization and use of the photographs is described in detail.

The education of the ambulatory diabetic, W. H. Olmsted (*Jour. Amer. Dietet. Assoc., 4 (1928), No. 1, pp. 26–34*).—In the author's practice ambulatory diabetic patients are placed in three groups according to their mental equipment. The first group consists of ignorant patients often met in the dispensary, the second group of those who have had the equivalent of a fourth-grade public-school education, and the third those who have sufficient intelligence to use the metric system and make the necessary calculations. The patients in the first group are taught to measure their food by eye or in measuring cups. In the second group the cup-teaspoon method is employed. This consists in the use of tables of foods with the equivalents in cups of one, two, three, or more teaspoons of sugar. These tables, with another in which protein and fat foods are grouped by relative amounts of protein and fat, enable the patients to select their food in terms of sugar and fat.

Progress of the science of nutrition in Japan, T. Saiki (*Geneva: League of Nations, Health Organ., 1926, pp. 387, pls. 3, figs. 47*).—This is the complete report for the League of Nations of nutrition studies conducted in various institutions of Japan, particularly the Imperial State Institute for Nutrition at Tokyo. The papers and authors are as follows: The Basal Metabolism or Normal Japanese Men and Women (pp. 11–36), The Measurement of the Body Surface Area of Man (pp. 49–62), and Metabolism during Fasting and Subsequent Re-feeding (pp. 63–82), all by H. Takahira; The Basal Metabolism of Common Labourers (pp. 37–42), by H. Takahira, S. Kitagawa, E. Ishibashi, and S. Kayano; On the Energy Exchange in the Various Industrial Occupations (pp. 43–48), by K. Takahashi; Improvement of the Physical Condition of Malnourished Children (pp. 83–86), by T. Kawakami and C. Takanabe; Studies on the Digestibility and Utilisation of Rice of Different Grades of Polishing (pp. 87–154), by K. Sugimoto; the Digestibility and Utilisation of Rice Cooked by Different Methods (pp. 155–233), by K. Sugimoto, M. Higuchi, S. Momoyeda, S. Tanaka, and Y. Yasuda; The Biological Value of the Nitrogenous Substances Found in Our Main Vegetable Foods (pp. 235, 236), by K. Furumi; Biochemical Studies on Rice.—Differences in the Physico-Chemical Properties of the Protein Oryzenin as It Occurs in Glutinous and in Common Rice (pp. 237–246) and Physico-Chemical Studies Concerning the Specificity of Proteins of Different Varieties and Subvarieties of Rice (pp. 247–250), both by T. Tadokoro, Y. Nakamura, and S. Watanabe; Differences between Some Physico-Chemical Properties of Common and Glutinous Rice Starch (pp. 251–271), by T. Tadokoro et al.; Biochemical Studies of Rice.—Part I. Oxidase (pp. 273–294), by T. Higuchi; The Relationship between the Chemical Composition of Rice and Its Different Grades of Polishing (pp. 295–307), by T. Higuchi, M. Kondo, M. Hara, S. Narita, and K. Matsuzawa; The Relative Nutritive Value of Various Proteins Contained in Japanese Food Articles (pp. 309–329), by U. Suzuki, Y. Matsuyama, and N. Hashimoto; Chemical Properties and Nutritive Value of the Protein of Italian Millet (*Setaria italica* Kth) (pp. 331–335), by M. Kondo; Studies on the Protein of Buckwheat (*Fagopyrum esculentum* Moench.) and Its Nutritive Value (pp. 337–341), by M. Hara; Vitamin Content of Japanese Food Materials (pp. 343–359), by Y. Shimoda, Y. Fujimaki, H. Matsumuro, and S. Saiki; Effect of Alkaloids on Animals Fed on Diets Deficient in Vitamins (pp. 361–366), by S. Saiki; Relationship between the Quantity of Salts in a Diet and Vitamin A Deficiency (pp. 367, 368), by F. Nakamura; and Formation of Urinary and Bile-Duct Calculi in Animals Fed on Experimental Rations (pp. 369–381) and Formation of Gastric Carcinoma in Albino Rats Fed on Deficient Diets (pp. 383–387), both by Y. Fujimaki.

The vitamin A content of white yautia, yellow yautia, and plantain, with further evidence of a possible relationship between the color of a natural food and its richness in vitamin A, E. J. QUINN and D. H. COOK (*Amer. Jour. Trop. Med., 8 (1928), No. 5, pp. 503–506*).—Essentially noted from another source (E. S. R., 57, p. 690).

Vitamin A of corn concentrated in endosperm (*Illinois Sta. Rpt. 1928, p. 303*).—Studies carried on by L. Millhouse, H. C. Koser, O. Rocke, and R. A. Hetler on the content of vitamin A in the various structural parts and milling products of yellow corn have shown that the greater part of the vitamin is concentrated in the endosperm and hence is found in the gluten. Sufficient vitamin A for normal growth and resistance to lung and eye infection was supplied by from 10 to 20 per cent of gluten feed or whole corn or from 5 to 10 per cent of gluten. Some vitamin A was found in crude corn oil but practically none in the refined oil.

The relative stability of vitamin A from plant sources, H. C. SHERMAN, E. J. QUINN, P. L. DAY, and E. H. MILLER (*Jour. Biol. Chem., 78 (1928), No. 2, pp. 293–298*).—In this investigation of the stability of vitamin A in plant materials to heat in the presence or absence of oxygen and at different H-ion concentrations, and of the relative stability under these conditions of vitamin A in plant and animal sources, feeding experiments following the technique of Sherman and Munsell (E. S. R., 54, p. 89) were conducted in pairs upon litter mates of essentially the same weight, one being fed one material and the other the same material but differently treated or a different material similarly treated. In the first series of experiments, filtered tomato juice was heated under aerobic and strictly anaerobic conditions for 4 hours at a temperature of 97°±2° C. The former condition was secured by bubbling air through the liquid during the heating process and the latter by bubbling nitrogen through the liquid for 2 hours before heating and during the entire heating process. Unusual precautions were taken to prevent the entrance of air into the liquid at any time.

Under these conditions 7 cc. of the juice heated under anaerobic conditions was found to be equivalent in vitamin A content to 5.8 cc. of unheated juice. On repeating the experiment with the aerated juice, approximately the same results were obtained.

In the second series of experiments, tomato pulp brought to a pH of 9.2 was compared with pulp at the natural acidity of pH 4.2, the two samples being heated at 98°±2° under an atmosphere of nitrogen. In daily doses of 2 cc. there was an average weight gain for the 8-week period of 47 gm. for the juice at pH 4.2 and 45 gm. for the juice at pH 9.2, thus showing no appreciable change in stability to heat with change in H-ion concentration.

In the comparison of the stability of vitamin A in plant and animal materials, solutions of dried, powdered spinach and of butter in olive oil were used as the sources of vitamin A. On heating these for 4 hours under anaerobic conditions at 97°±2°, the spinach showed a loss of 20 per cent and the butter of about 33 per cent in vitamin A activity. In commenting upon this difference in stability between animal and plant sources of vitamin A, the authors state "until more is known regarding the possible presence and relative activity of oxidizing substances in olive oil, spinach, and butterfat, any discussion of the question as to whether the destruction of vitamin A here observed may have been due to an oxidation reaction, even though dissolved and atmospheric oxygen had been excluded, would, in our judgment, be premature."

Vitamin A deficiency and metaplasia, H. GOLDBLATT and M. BENISCHEK (*Jour. Expt. Med.*, *46* (*1927*), *No. 5, pp. 699–707*).—In view of the fact that the experimental diets used by Mori (E. S. R., 48, p. 260) and by Wolbach and Howe (E. S. R., 54, p. 891) in studies of the tissue changes in vitamin A deficiency were deficient in vitamins C and D, as well as vitamin A, the authors have conducted a similar investigation on rats, using a complete diet, a diet deficient in vitamin A alone, and a diet deficient in both A and D.

The pathological results obtained with diets deficient in vitamin A alone were as extensive as with diets deficient in vitamins A and D. Metaplastic changes were observed in one or more of the following organs: Trachea, large bronchi, small bronchi or bronchioles in lung, posterior nares, accessory salivary glands of base of tongue, paraocular, submaxillary, sublingual, and parotid glands, renal pelvis, ureter, and bladder. Inanition as the cause of these changes was ruled out, inasmuch as a group of rats receiving an adequate supply of vitamins but no other food without exception showed none of the metaplastic changes observed in practically all of the animals on diets deficient in vitamin A. It is concluded, that "epithelial metaplasia to the squamous keratinizing type is of such frequency in young rats kept on a diet deficient in vitamin A for a long period of time (10 weeks or longer) as to constitute a good morphological indicator of the deficiency of this vitamin in the diet."

Dietary requirements for fertility and lactation, [XVII, XVIII], B. SURE (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 2, pp. 87–99, figs. 5*).—In continuation of the series of studies previously noted (E. S. R., 59, p. 492), two papers are presented.

A dietary sterility associated with vitamin A deficiency (pp. 87–92).—Data are presented which in the author's opinion afford positive evidence that sterility of the same type as that produced by a deficiency of vitamin E (resorption of the fetus) can be produced in rats on diets furnishing an abundance of vitamin E but deficient in vitamin A.

The ration used had the following composition: Skim milk powder (produced from summer milk) 50 per cent, agar-agar 2, ferric citrate 0.2, wheat oil 3, Harris yeast 1, and dextrin 43.8 per cent. On this diet 2 females out of 3 gave birth to three litters each and weaned 15 young out of 35 allowed to be raised. The third litter of one of these rats was selected for continuing the experiment. Of the 5 females in this litter, 2 produced no young and showed typical resorption weight curves. One had a normal first litter, but resorbed the second, and 1 gave birth to two litters, but did not raise them to weaning age.

The vitamin A content of wheat oil (pp. 93–99).—Wheat embryo oil obtained by percolation with cold acetone was found capable of curing ophthalmia in young rats on a diet deficient in fat-soluble vitamins and of promoting excellent growth for a period of from 10 to 16 weeks when fed in daily doses of 0.05 cc.

The tripartite nature of vitamin B, R. R. WILLIAMS and R. E. WATERMAN (*Jour. Biol. Chem.*, *78* (*1928*), *No. 2, pp. 311–322, figs. 5*).—This is the complete report of an investigation, noted in part from a preliminary report (E. S. R., 58, p. 691), in which the authors have confirmed the existence in vitamin B of two factors, the relatively thermolabile antineuritic vitamin and the relatively heat-stable factor associated with the prevention and cure of pellagra (vitamins F and G). Evidence has also been obtained of the presence in certain sources of vitamin B of a third highly thermolabile substance which is apparently essential to the growth of pigeons, but not of rats. The evidence on this point consists essentially in the demonstration that while the antineuritic fraction and the heat-stable fraction obtained from yeast are together incapable of promoting growth in pigeons when fed as the sole source of vitamin B in a synthetic diet, freshly dried yeast is capable of doing this. On changing the synthetic diet to one of whole wheat, there is also a prompt growth response.

The paper includes a description of the apparatus and technique devised by the authors to secure highly active preparations of the antineuritic vitamin by adsorption on fuller's earth, with the interposition of a collodion membrane which retains impurities of high molecular weight but not the antineuritic vitamin.

The plural nature of vitamin B, A. G. HOGAN and J. E. HUNTER (*Jour. Biol. Chem.*, *78* (*1928*), *No. 2, pp. 433–444, figs. 5*).—The authors have demonstrated by feeding experiments on pigeons, chickens, and rats that prolonged irradiation with a mercury vapor arc destroys vitamin G, but not vitamin F, as present in yeast and yeast concentrates.

The irradiated material was prepared by exposing the dry powdered yeast or yeast concentrate in thin layers on glass plates at a distance of 25 cm. from the lamp for 10 hours, during which the highest temperature recorded was 40.1° C. As a source of vitamin G, similar preparations were thoroughly moistened with water, heated for 2 hours in an autoclave at 120°, and then dried and powdered. The basal diet used in practically all of the feeding tests consisted of casein 20, cornstarch 58, lard 10, cod-liver oil 5, cellulose 3, and Osborne and Mendel's salt mixture 4 per cent. The casein was purified by washing continuously for 1 week with dilute acetic acid.

With one or two exceptions all of the experimental animals receiving either the irradiated or autoclaved yeast as supplement to this ration lost weight and died. On a mixture of the irradiated and autoclaved yeast or on the untreated yeast, the pigeons maintained their weight or showed a slight increase and the chickens and rats gained in weight. There were some deaths among all of the animals except the rats receiving the mixture of irradiated and of autoclaved yeast, but the percentage of survivors was not much higher in the control group receiving untreated yeast than among those receiving the mixture of autoclaved and irradiated yeast.

Interesting differences are brought out between the behavior of the pigeons on the two fractions. The body temperatures of those receiving autoclaved yeast (vitamin G) were lower than those receiving irradiated yeast, the lowest readings obtained being 99 and 104.4°, respectively. The temperatures of the pigeons receiving the mixture ranged from 105 to 108.5°. The majority of the pigeons receiving autoclaved yeast showed the typical head retraction of polyneuritis shortly before death, while most of those receiving irradiated yeast passed into a stupor without indications of head retraction.

Synthesis of vitamin B by microörganisms, G. Sunderlin and C. H. Werkman (*Jour. Bact., 16 (1928), No. 1, pp. 17-33, figs. 8*).—The ability of microorganisms to synthesize vitamin B was tested by feeding the organisms in the moist condition separately to young rats which had ceased to grow and showed definite symptoms of vitamin B deficiency. The rats were not kept on raised screens and consequently the amounts of materials required for growth can not be considered minimum. In comparison with the growth curves on the basal vitamin B-free diet, evidence was obtained, however, of synthesis of vitamin B in varying amounts by all of the organisms tested, which included *Torula rosea, Oospora lactis, Bacillus adhaerens, Bacterium coli, Bacillus subtilis, B. mycoides, Azotobacter chroococcum, Rhizobium leguminosarum*, and Actinomyces.

It was also shown that three different strains of *B. coli* were alike in their ability to synthesize vitamin B, and that drying at 37 or 100° C. for 48 hours did not diminish their activity appreciably. The amounts required to promote satisfactory growth were fairly large, 2 gm. in most cases causing only very slight growth and 8 gm. rapid growth.

The synthesis of vitamins by microorganisms, G. Sundferlin and C. H. Werkman (*Iowa Acad. Sci. Proc., 34 (1927), pp. 93, 94*).—A brief summary of the investigation noted above.

Vitamin B found in embryo and endosperm of oats (*Illinois Sta. Rpt. 1928, pp. 303, 304*).—A study by C. Rocke and R. A. Hetler of the distribution of vitamin B in the structural parts of the oat kernel, similar to previous studies by Croll and Mendel on the corn kernel (E. S. R., 54, p. 793) and by Croll on the rice kernel (E. S. R., 58, p. 390), has shown that the vitamin is present both in the embryo and in the endosperm parts of the grain, with a slightly greater concentration in the former. A preliminary study of the vitamin A content of oats indicates that the concentration of this vitamin in the oat kernel is almost negligible.

The effect of ethylene upon the vitamin B content of celery, M. F. Babb (*Science, 68 (1928), No. 1758, p. 231*).—A comparison of ethylene-blanched and board-blanched celery for its vitamin B content has given no evidence of the destruction of vitamin B in bleaching by ethylene.

Diet rich in vitamin B needed during lactation (*Illinois Sta. Rpt. 1928, pp. 302, 303, fig. 1*).—Further studies conducted by C. Rocke, M. Plant, and R. A. Hetler on the distribution of vitamin B in the various milling products of corn (E. S. R., 58, p. 390) have shown that hominy feed when fed at a level of 40 per cent of the diet furnishes sufficient vitamin B for the normal growth of rats from the time of weaning to maturity, but that 50 per cent of whole corn is necessary for like results. Normal reproduction occurred in both cases, but it was found impossible to secure normal development or a healthy condition of the young when either hominy feed or whole corn furnished the sole source of vitamin B during the lactation period.

An investigation to determine a satisfactory standard for beriberi-preventing rices, E. B. Vedder and R. T. Feliciano (*Philippine Jour. Sci., 35 (1928), No. 4, pp. 351–389, pls. 2, figs. 8*).—A large number of samples of rice from various sources and of varying degrees of milling have been subjected to chemical analysis and tested for their antineuritic properties for pigeons with a view to establishing some index for judging the value of rice for preventing beriberi.

The simplest and most practical method for use in armies and institutions is thought to be the determination of the proportion of the external layers remaining, by staining with Gram iodine solution. No rice having 50 per cent or more of the external layers remaining was found to produce polyneuritis when fed to pigeons. Of the various standards which have been proposed from time to time, an ash value of 1.05 per cent is considered a poor index, a content of phosphorus pentoxide of 0.62 per cent somewhat better, and 1.28 per cent of fat the best single chemical index for a beriberi-preventing rice. A combined chemical index is proposed as follows:

"Any rice having 1.77 per cent of phosphorus pentoxide plus fat, but not less than 0.4 per cent phosphorus pentoxide, or any rice having not less than 0.62 per cent phosphorus pentoxide, or any rice having not less than 0.50 per cent phosphorus pentoxide and with at least 75 per cent of the external layers of the grain remaining."

Thorough washing of the rice was found to reduce the phosphorus pentoxide content from an average of 0.447 to 0.197 per cent, and it is thought possible that the antineuritic vitamin content was similarly reduced. Samples of undermilled rice infested with insects were found to suffer marked losses in fat, phosphorus pentoxide, and ash, and 7 undermilled rices that should have prevented polyneuritis were converted by insects into highly milled rices that produced polyneuritis.

The immediate physiological action of a vitamin [trans. title], N. Bezssonoff (*Compt. Rend. Acad. Sci.* [*Paris*], *186 (1928), No. 13, pp. 914–916*).—In the investigation reported, adult guinea pigs were fed successively in 48-hour periods the author's scorbutic ration (E. S. R., 56, p. 690) and the same ration with the addition of cabbage, lemon juice, or a vitamin C concentrate in amounts calculated to furnish sufficient vitamin C to protect against scurvy. At the end of each period the animals were weighed, and the urine was collected for determinations of the amount of bromine it was capable of fixing.

With every lot the vitamin periods were marked by an increase in weight or decrease in loss of weight and by a marked increase in the bromine-fixing power of the urine, this reaction evidently preceding the gains in weight.

It is noted also that the blue color reaction thought by the author to be characteristic of vitamin C (E. S. R., 49, p. 805) is negative until a vitamin C dosage of about five times the minimum has been reached. This is thought to indicate that the optimal dose of vitamin C is at least five times the minimum protective dose. The conclusion is drawn that the immediate effect of a deficiency of vitamin C, even though partial, is in reducing the elimination of toxic substances, and that if prolonged through many years it must contribute to the phenomenon of degeneration which constitutes old age.

Contributions to the biochemistry of the avitaminoses.—VII, The influence of experimental scurvy on the synthesis of hippuric acid [trans. title], A. Palladin and D. Zuwerkalow (*Biochem. Ztschr., 195 (1928), No. 1–3, pp. 8–13*).—In continuation of the series of studies which have been noted in part (E. S. R., 53, p. 766), an attempt has been made to determine whether or not scurvy in guinea pigs interferes with the process of synthesizing hippuric acid from injected benzoic acid.

In general the scorbutic guinea pigs showed a lowered ability to synthesize hippuric acid. In all cases there was a decided decrease in the spontaneous output of hippuric acid, particularly in the period in which the food consumption had not yet decreased.

A method for the biological assay of cod liver oil, G. Adams and E. V. McCollum (*Jour. Biol. Chem., 78 (1928), No. 2, pp. 495–524*).—In this investigation of the value of various existing methods of determining the vitamin D content of cod-liver oils, a preliminary comparison was made of the relative merits of various rachitic diets, particularly with respect to satisfying the growth requirements of rats. The diets tested included the Sherman-Pappenheimer diet 84 (E. S. R., 46, p. 165), the Steenbock yellow corn ration 2965 (E. S. R., 54, p. 489), and various diets proposed by McCollum and coworkers. All of these diets except the Sherman-Pappenheimer were found to be satisfactory, and of these the McCollum diet 3143 was arbitrarily chosen for the experimental work. From preliminary tests a 21-day period was taken for the development of rickets, an 8-day period for testing the oils, and the dosage of oils 0.125 per cent of the ration. With these details followed consistently, a series of experiments was run with 17 different samples of the oil, data being obtained on the line test; the calcium and phosphorus content of the blood, with calculations of the relationship of calcium to phosphorus; and the ash, calcium, and phosphorus content of the dried fat-free bones (femurs). In the line test the tibias were used for microscopic examination. It is considered essential to use the microscope rather than the naked eye in order to detect early changes toward healing.

The changes in bone composition, while following the general trend of the rachitic condition, were found to show such pronounced individual variations as to be unreliable criteria for judging the extent of rickets, a conclusion contrary to the general opinion. The results of the blood analyses calculated to give the iron product values $[Ca^{++}]^3 \times [PO_4^{\equiv}]^2$ could be correlated with the microscopic line test observations in practically all cases. It is considered, however, that the data can be interpreted to indicate only the relative potency of oils, and that there is no justification for the establishment of arbitrary units of antirachitic factor for a given weight of oil. It is thought that any of the better grades of cod-liver oil upon the market will afford protection in the doses ordinarily indicated and for the period usually involved.

The antirachitic effect of ergot, E. Mellanby, E. M. Surie, and D. C. Harrison (*Jour. Physiol., 65 (1928), No. 4, p. XXIX*).—Ergot in amounts small enough not to produce toxic effects has been found to have a marked antirachitic effect on dogs. This is considered of particular interest in suggesting the possibility of the synthesis of vitamin D from ergosterol independently of sunlight, inasmuch as ergot has a bluish black covering thought to be impenetrable to radiations.

The antirachitic action of irradiated ergosterol in children and adolescents, S. J. Cowell (*Brit. Med. Jour., No. 3522 (1928), pp. 5–7*).—In this discussion of the success attending the use of commercial preparations of irradiated ergosterol (radiostol or radiostoleum) in five cases of early and late rickets, the author emphasizes the fact that irradiated ergosterol, unlike cod-liver oil, does not contain vitamin A, and that whenever it is used as the antirachitic agent it is essential to see that a sufficient supply of vitamin A is given at the same time.

The physiological effects of radiation, H. LAURENS (*Physiol. Rev.*, 8 (1928), *No. 1, pp. 1-91*).—This is an extensive review of the literature on the effect of radiant energy on the skin, eyes, circulating system, blood, and metabolism, and on its mode of action. Under metabolism are discussed the effects on general metabolism, rickets, tetany, growth, activation of inert substances, and respiratory metabolism.

TEXTILES AND CLOTHING

The foundations of yarn-strength and yarn extension, A. J. TURNER (*Jour. Textile Inst.*, 19 (1928), *No. 7, pp. T286-T314, pl. 1, figs. 3*).—Part 1 of this contribution from the technological laboratory of the Indian Central Cotton Committee points out that ultimately the values obtainable for the strength and extension of a yarn depend on the fiber characters, yarn structure, sampling methods and errors, and test conditions. Part 2, devoted to a general discussion of the relation between yarn strength and fiber strength, refers in particular to the relative importance of the several factors concerned.

The influence of the degree of twist in yarns on the results of yarn mercerisation and on the properties of plain fabrics made from grey or mercerised cotton yarns.—Part II, The results of various tests on the fabrics, W. E. MORTON and A. J. TURNER (*Jour. Textile Inst.*, 19 (1928), *No. 5, pp. T189-T222, figs. 10*).—This paper reports the continuation of earlier work[1] dealing with the preparation and properties of 9 types of twofold yarns made in a range of singles and doubling twists, of the mercerization of each type of twofold yarn by two different methods, of the weaving of three plain fabrics—open, medium, and close woven—from each of the 27 types of yarn available, and of tests of the 81 fabrics for strength and extensibility. Further tests on most of the fabrics are reported, with descriptions of test apparatus, including a new machine for measuring resistance to wear. The merits of the various fabric tests are commented on briefly.

The highest breaking strength values per single thread were given by the medium and close fabrics, whether gray or mercerized, made from yarns having soft twofold twist. The close fabrics surpassed the medium fabrics and the medium fabrics the open fabrics. In rip strength fabrics made from yarns having hard singles twist and soft twofold twist were superior. The open fabrics resisted ripping much better than the closer fabrics and the mercerized fabrics than the gray fabrics. The close fabrics made from yarns spun with soft singles twist and medium twofold twists showed greatest resistance to wear, gray fabrics being much superior to the mercerized. It did not appear that a fabric could be superior in all desirable characteristics to all others made from yarns of a given count. If resistance to wear be taken as the criterion, the best all-around fabric is a fairly close woven gray fabric made from twofold yarns having soft singles twist and medium doubling twist and is closely followed by a gray fabric made from twofold yarns having medium singles twist and soft doubling twist. The best of the mercerized fabrics was made from twofold yarns having soft singles twist and medium doubling twist and the next best from twofold yarns having hard singles twist and hard doubling twist. These results are held to apply only to fabric in the loom state, no evidence being available on their behavior after repeated washings.

Tests on the penetration of dyestuffs through cotton oiled in the picker room, A. H. GRIMSHAW (*Textile World*, 74 (1928), *No. 13, pp. 137, 138,*

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[1] Part I, H. K. Corser and A. J. Turner. Jour. Textile Inst., 14 (1923), No. 10, pp. T332-T360.

figs. 4).—An investigation at the North Carolina State College Textile School on yarns and raw cotton demonstrated that cotton sprayed with emulsifiable mineral oils would, after scouring and bleaching, give uniform results in dyeing. The penetration appeared to be quite satisfactory.

Primary action of chromic acid on animal fiber [trans. title], M. A. Il'inskiĭ (Iljinsky) and D. I. Kodner (*Zhur. Russ. Fiz. Khim. Obshch. Leningrad. Univ., Chast Khim., 60 (1928), No. 1, pp. 193–207, figs. 6; abs. in Jour. Soc. Chem. Indus., Brit. Chem. Abs. B, 47 (1928), No. 23, p. 401*).—Investigation showed that wool fiber readily adsorbs chromic acid in the cold, forming a bright yellow stable complex, and that the quantity adsorbed is proportional to the time of reaction and concentration of solution, reaching a maximum at about 85 per cent adsorption. The complex is in every case one of the basic fiber with dichromic acid, irrespective of the nature of the original chromium salt. The maximum amount taken up by the fiber is 0.09 to 0.1 gram molecule per 100 gm. of wool.

Addition of sulfuric acid above a certain limit, as also rise of temperature, was found to have no effect on the final adsorption. Dichromate complexes are not hydrolyzed by water like the sulfuric and hydrochloric acid complexes, both of the latter being quantitatively displaced by the addition of chromic acid. Silk fiber likewise forms dichromic acid complexes in the cold, and this property affords a means of dyeing woolen and silk fiber with lake colors and effecting an economy of more than 90 per cent in the use of steam in mordanting. For colors easily oxidized the dichromic acid complex can be reduced on the fiber by means of bisulfite.

Accurate testing of dyed silks for fastness to perspiration presents many difficulties, F. Grove-Palmer (*Textile World, 74 (1928), No. 13, pp. 153, 155*).—Psychological and physiological factors in perspiration are discussed as affecting the satisfactory testing of dyed silks for fastness to perspiration by actual association with the human body. Of the laboratory tests adopted by chemical associations in America and Europe, the one used by the American Association of Textile Chemists and Colorists (E. S. R., 58, p. 796) appears to approximate most nearly the actual conditions of perspiration, and comparisons of this test with those conducted by persons wearing the dyed fabric have shown marked similarity of results. Even this test, however, does not allow for the variations in the character of perspiration among the consumers.

Rayon issue (*Textile World, 74 (1928), No. 13, pp. 53–98, figs. 58*).—As in a previous group (E. S. R., 58, p. 95), the articles included in these pages deal with the status, prospects, and important developments in the industry, new uses for rayon and new manufacturing methods, dyeing, testing, and textile research involving rayon.

MISCELLANEOUS

A year's progress in solving farm problems in Illinois: [Forty-first Annual Report of Illinois Station, 1928], compiled and edited by F. J. Keilholz (*Illinois Sta. Rpt. 1928, pp. 321, figs. 53*).—This contains the organization list and a summary of the work during the year ended June 30, 1928. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Fortieth Annual Report of [Kentucky Station], 1927, I, T. P. Cooper (*Kentucky Sta. Rpt. 1927, pt. 1, pp. 44*).—Part 1 of this report contains the organization list, a financial statement as to the Federal funds for the fiscal year ended June 30, 1927, a report of the director on the work and publications of the year, and meteorological data noted on page 207. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

NOTES

Maryland University and Station.—Dr. Eugene C. Auchter, professor of horticulture and chief horticulturist, has accepted an appointment as principal horticulturist in the Bureau of Plant Industry, U. S. Department of Agriculture, and assumed charge November 16 of the newly established office of horticultural crops and diseases. This office includes the vegetable gardening, pomological, and related lines of the former office of horticulture, the physiological projects of the office of plant geography and physiology, most of the work of the pathological laboratory and the office of vegetable and forage diseases, the entire office of fruit diseases, and the office of crop physiology and breeding. Dr. Victor R. Boswell, associate professor of horticulture and assistant olericulturist, has been appointed senior horticulturist in the same office to have charge of the investigations in vegetable production.

Michigan Station.—G. M. Trout, assistant professor of dairy husbandry and junior dairy husbandman in the West Virginia University and Station, has been appointed assistant in the dairy department, effective November 1, 1928. Other appointments include the following research assistants: Merle C. Moore in home economics, effective November 15; Walter Toenjes in horticulture, effective December 1; and H. H. Wedgworth, formerly connected with the Mississippi Plant Board, in plant pathology, effective December 1.

American Society of Agronomy.—The twenty-first annual meeting of this society was held at Washington, D. C., November 22 and 23, 1928.

The president's address was given by A. G. McCall, Chief of Soil Investigations, U. S. Department of Agriculture, on a national program for soil research. Dr. McCall proposed a nation-wide plan looking to the best utilization of American soils and the most economical production and the widest distribution of products. The plan is based on an inventory of the soil fertility of the entire nation and an accounting of the particular assets and liabilities of the soils by great regional areas and, more intensively, by States. Dr. McCall pointed out that the basis for such an inventory has already been laid in the soil surveys of this Department, which cover more than half the agricultural area of the country. His program would involve the cooperation of the State experiment stations with the Federal Government in a plan of research which would include the completion of the soil survey already in progress, the inauguration of a program of fertilizer research based on the soil survey, a study of methods for the control of soil erosion, a survey of the soil organic matter of the United States, and a study of methods for the diversion or utilization of surplus products of the soil and the waste materials of the farm so that they may become the raw materials of industry.

The meetings opened with a symposium on soil organic matter and green manuring led by J. G. Lipman. Papers were presented on Relation of Soil Type and Climate to the Occurrence and Distribution of Organic Matter, by C. F. Marbut; Organic Matter Problems in Humid Soils, by T. L. Lyon; Organic Matter Problems Under Dry Farming Conditions, by J. C. Russell; Organic Matter Problems in Irrigated Soils, by P. S. Burgess; Chemical and Microbiological Principles Underlying the Use of Green Manures, by S. A. Waksman, and Green Manuring and its Application to Agricultural Practices, by A. J. Pieters and R. McKee.

In the soils section the first symposium on application of base exchange methods, which was led by F. W. Parker, included papers on The Determination of the Exchange Capacity of Soils, by W. P. Kelley; The Origin, Nature, and Isolation of the Inorganic Base Exchange Compound of Soils, by E. Truog;

The Determination of Exchangeable Hydrogen in Soils, by F. W. Parker; Methods for Studying Exchangeable Bases in Calcareous Soils, by P. S. Burgess; The Use of Electrodialysis in Studying Base Exchange Phenomena in Soils, by R. Bradfield; and The Use of Artificial Zeolites in Studying Base Exchange Phenomena, by O. C. Magistad.

A second soils symposium on soil erosion was led by H. H. Bennett. Among the papers in this group were Erosion in the Orient as Related to Soil Conservation in America, by W. C. Lowdermilk; The Results and Significance of the Spur (Texas) Run-off and Erosion Experiment, by R. E. Dickson; Erosion on Range Land, by W. R. Chapline; The Prevention of the Erosion of Farm Lands by Terracing, by C. E. Ramser; and The Necessity for Soil Conservation, by A. K. Short.

A symposium on lime, led by O. S. Fisher, was of direct interest to extension specialists and included papers on The Portable Soil Laboratory and the Ohio Method of Testing Soils for Acidity, by E. Jones; Lime Surveys for Use in Illinois and Testing for Lime Requirement, by C. M. Linsley; The Kentucky Marl Beds as a Source of Lime Material, by S. C. Jones; and The Development of Equipment for Dredging Marl from the Michigan Lakes, by L. F. Livingston.

Tobacco Research was the subject of the symposium led by W. L. Slate in the crop section. The opening paper, The Chemical Approach to the Study of Problems of Tobacco Fertilization, by D. E. Haley, was followed by papers on The Effect of Other Crops on Tobacco, by J. P. Jones; Tobacco as an Indicator Plant in Soil Studies, by M. F. Morgan; Nutritional Problems in Bright Tobacco, by E. G. Moss; Nutritional Deficiency Studies, by J. E. McMurtrey; A Water Culture Technique for Studies in Tobacco Nutrition, by A. B. Beaumont; Soil Reaction Studies, by P. J. Anderson; and Factors Affecting Nicotine Content, by C. W. Bacon.

An open session for both crops and soils, concluding the meetings, embraced papers on A Comparison of Good and Poor Alfalfa Soils, by R. R. McKibbin; The Effect of Certain Injuries Upon the Leaves and Stalks of Corn Plants Upon Weights Produced of Grain and Vegetation, by A. N. Hume; Soil and Land Valuation Short Courses, by W. H. Stevenson and P. E. Brown; Inheritance of Immunity from Black Stem Rust, Yield, and Protein Content in Hope Wheat Crosses with Susceptible and Resistant Varieties, by J. A. Clark and E. R. Ausemus; Recent Trends in Fertilizer Consumption in Europe, by H. R. Smalley; The Production of Artificial Manure from Oats Straw Under Control Conditions, by P. E. Brown and F. B. Smith; Correlation Between Electromotive Series and the Absorption of Electrolytes and the Relation of These to Nutrition, by H. P. Cooper and J. K. Wilson; Some Errors Peculiar to Forage Crop Experimentation, by L. W. Kephart and E. A. Hollowell; and Studies on Iron Accumulations in the Nodal Tissues of Dent Corn Plants, by J. F. Trost.

The usual reports were received from the editor, the secretary-treasurer, and the several committees of the society, and C. F. Marbut, A. J. Pieters, G. Roberts, O. Schreiner, and A. T. Wiancko were elected fellows. An incident of the session was the presentation of the Chilean Nitrate of Soda Nitrogen Research Award to E. B. Fred of Wisconsin, J. G. Lipman of New Jersey, T. L. Lyon of New York, and F. T. Shutt, Dominion Chemist of Canada, all for outstanding research on nitrogen.

Officers for the ensuing year are as follows: President, M. J. Funchess; vice presidents, C. McKee, W. W. Burr, A. B. Beaumont, and S. A. Waksman; editor, J. D. Luckett; secretary-treasurer, P. E. Brown; and representatives on the council of the American Association for the Advancement of Science, H. K. Hays and R. B. Salter.

EXPERIMENT STATION RECORD

VOL. 60 MARCH, 1929 No. 4

The annual meeting of the American Society of Animal Production, which of late has been held at Chicago just prior to the opening of the International Livestock Exposition, is becoming a more and more important gathering for animal husbandmen in the agricultural colleges, the experiment stations, and the extension services of the States and in the United States Department of Agriculture. As the years go by, the International is being increasingly recognized as a sort of Mecca to which the animal husbandry interests of the Nation are drawn in annual pilgrimage. The scheduling of the society's meeting in close proximity to this event thus has the immediate advantage of insuring to the society a maximum attendance, but it also renders a very useful service by affording an auspicious opportunity for the presentation of papers and the interchange of ideas by those who are directly concerned with the advancement and dissemination of knowledge in its important field.

The meeting held from November 30 to December 2, 1928, marked the twentieth anniversary of the society, which now numbers over 300 members representing all sections of the country and with several from without its borders. It may not be generally recalled that the society had its beginnings in the vision of a small group of nutrition specialists who, at the Graduate School of Agriculture held in July, 1908, at Cornell University, selected Drs. H. P. Armsby, W. H. Jordan, and H. J. Waters, Prof. H. R. Smith, and Dean J. H. Skinner as an organization committee for investigators in animal nutrition. At a later meeting in Chicago on November 26, 1908, the American Society of Animal Nutrition was formed for the primary purpose of improving the character of the research work in animal nutrition. Effort was first directed toward the establishment of more uniform methods of conducting the experiments and reporting the results and to the suggestion of problems urgently needing solution. Still another aim was the fostering of cooperation in this field between different experiment stations and the minimizing of the waste of effort and opportunity through failure of institutions or departments within the same institution to coordinate their work on the same problem.

The society was thus originally created by investigators and for investigators in animal nutrition, but the small attendance and the doubts in some quarters as to the real need of so specialized a body raised some question of its continuance. At the 1912 meeting it was voted to admit to membership those primarily interested in teaching and other phases of animal husbandry, and the name of the society was accordingly broadened to its present form. This change brought about a marked increase and diversification of interest, and the number of papers submitted for presentation at the annual meetings soon became so large that the more specialized articles were given in separate sections. During the last few years there have been regularly organized sections for animal genetics and the discussion of extension problems. Other groups have also held meetings apart from the general sessions for the consideration of special matters.

Despite the goodly attendance under existing conditions, the large number of members unable to be present has resulted in a demand for regional organizations, and at the 1928 meeting the formation of southern and western sections was authorized. It is planned that the first of these sections will function in connection with the annual meeting of the Southern Agricultural Workers, while the latter is expected to meet during the summer in one of the Western States.

During its existence the society has been active and progressive and has initiated various projects of general interest. One of these is embodied in the policy adopted in 1921 of giving special recognition each year to some member or members for meritorious achievement. The first recipient of this honor was Prof. J. H. Shepperd of North Dakota, who has had much to do with the development of student livestock judging contests. Plans were also under way to recognize similarly Dr. H. P. Armsby of Pennsylvania, largely instrumental for the organization of the society and its first president, but his death shortly before the meeting made necessary the conversion of this feature into a memorial. Subsequently, there were selected Dean H. L. Russell of Wisconsin, Prof. C. S. Plumb of Ohio, Deans Eugene Davenport of Illinois and C. F. Curtiss of Iowa, Dr. J. R. Mohler of the U. S. D. A. Bureau of Animal Industry, and Prof. Gordon H. True of California. The 1928 selection was unique in the choice of two brothers, Deans F. B. Mumford of Missouri and H. W. Mumford of Illinois. Both of these, it is of interest to note, were charter members of the society, and both have been drafted, as pointed out by Dean Davenport in his speech of introduction, into general administrative work.

Opportunity is also afforded by the society for contacts with the rising generation of animal husbandmen. At the annual dinner which concludes the program it has for some time been customary to include as guests the winning stock-judging team in the intercollegiate contest at the exposition and the winner of the annual medal essay contest sponsored by the Saddle and Sirloin Club. The subject in the 1928 essay contest was The Place of the Purebred in Commercial Livestock Production, and its winner a student at the University of Illinois, while the championship in the stock judging contest was awarded to the team from the Oklahoma A. and M. College.

The 1928 meeting was opened with an address by the president of the society, Mr. E. W. Sheets of the Bureau of Animal Industry. Taking for his subject Our Responsibility to the Livestock Industry, he made a vigorous plea for real leadership and a spirit of cooperation. More specifically he emphasized the need of careful thought in planning experiments so that they will eventually solve the practical problems they are designed to meet and thus make a positive contribution to knowledge. In discussing the control of variables in quality of meat experiments, he cited the factor of breeding as the one over which there is at present the least control, and pointed out that "it is not sufficient to compare one Shorthorn steer with another. We must compare steers of known blood lines—steers which are homozygous to the extent that if we find a peculiar muscle structure, or cell formation, or arrangement of connective tissue, or marbling of fat in one animal we may count on those same characteristics having been present in the second animal before the differences in feed or environment which we are studying began to make themselves felt." In conclusion President Sheets drew attention to the comparative lack of prominence thus far given to studies of the business side of animal production, and emphasized the need and opportunity for sound research in this field.

The program of the 1928 meeting was well proportioned, embracing numerous papers dealing with teaching, extension, and research methods, many presenting the results of specific investigations, and not a few in the nature of symposia. In the last-named class was a session given over to a discussion of the national cooperative study of the factors influencing the quality and palatability of meat. According to the report of the committee on cooperation, which has represented the society in this undertaking, 24 States have been participating in this project, their work dealing mainly with the effects of age, breeding, feeding, grade, and sex on the quality of beef and the effect of castration on lamb. Despite the lack of sufficient time for the committee to consider fully the plans for each additional experiment, much progress has been attained, and its influence has permeated the formulation and conduct of other projects.

Another committee report directly concerned with research was that on methods of investigation. This report recommended several amendments to the society's accepted procedure for conducting experiments looking toward greater refinement and more accurate measures of the results. These amendments contemplate the exclusive use of animals of known history and similar market grade, with more uniform grouping in the different lots. The frequent testing of scales and the treatment of experimental animals for disease were also advocated.

The various papers presenting the results of research were divided among the subjects of animal nutrition, animal breeding, and animal diseases, and in each of these a considerable range was covered. The papers on nutrition, for example, dealt with the number of animals per experimental lot, the use of phosphates as mineral supplements, the normal retention of food iron during growth and the utilization of the iron of protein feeds, calcium and phosphorus balances of milking cows, and problems with range cattle production and grazing.

In animal breeding, an account of the status of research in Europe was presented by Drs. E. W. Lindstrom and J. W. Gowen on the basis of observations made during the past year. Numerous other papers were given in the genetics section which dealt with inheritance and the physiology of reproduction in different classes of animals. Among these was an illustrated description of the development of the mammary gland through the embryonic stages.

The society has not attempted to cover the field of animal pathology, but the relations of this phase to animal production are necessarily so close as to merit considerable attention. One paper in this field was presented dealing with investigations on contagious abortion and the status of knowledge of this disease, while another was entitled The Physical Basis of Sterility. There was also a talk on the subject of Hygienic Aspects of Livestock Production, in which it was pointed out that both man and animals are paying a heavy penalty in the extra precautions necessary for disease control because of the modifications in their normal ecological relations resulting from man's civilization and the domestication of animals.

As the spokesman of the U. S. Department of Agriculture, Assistant Secretary R. W. Dunlap discussed a number of topics of interest. Among these were the importance of quality in breeding stock, the stabilization of producers and markets, the propaganda against meat, and the status of legislation against the entrance of diseased animals and as to the tariff on meat products.

The character of the papers as a whole was notably high, and the difficulties incident to an overcrowded program which have been encountered at some previous meetings were little in evidence. In most cases there was ample time for discussion, the attendance was excellent, and interest was well sustained. All this was in marked contrast to the small number present in the early days and the general feeling of pessimism and uncertainty then prevailing. The change is doubtless to be explained in part by the broader scope of the society and its resultant wider appeal. Much should probably also be ascribed to the increased interest in animal husbandry and the enlarged conceptions of the opportunities afforded for constructive research, education, and extension. In any event the society deserves congratulations for all it has done and is doing in these directions, as well as hearty encouragement and support for the future.

The annual assembly of workers in economics and sociology continues to hold much of interest from the point of view of research in agricultural economics and rural sociology. Notwithstanding the remarkable progress of the last decade, research in these specialized fields is still relatively in the pioneer stage. Objectives are not always clearly visualized, and methods are still in the making. The continued consideration of these and related problems is therefore timely and pertinent, and the keen interest evidenced in the matter by the organizations most directly concerned is alike significant and encouraging.

The 1928 meetings, which were held in Chicago from December 26 to 29, brought together a large and representative attendance of workers in the economic and social sciences, and practically all of the groups devoted more or less time to subjects bearing on agricultural research in their respective fields. As would be expected, this was particularly true of the programs of the American Farm Economic Association and the divisions of social psychology and social research and the sections of rural sociology and the community of the American Sociological Society. Individual topics and joint sessions of more or less direct interest also appeared, however, on the programs of other bodies, such as the American Economic Association, the American Political Science Association, the American Statistical Association, the Stable Money Association, and the section on religion of the American Sociological Society, so that as a whole the opportunities for enlightenment in this direction were many and appealing.

In the meetings of the American Farm Economic Association, half-day sessions were devoted to the subjects of formulating outlook material and carrying it to the farmer, the outlook and economic and socio-economic consequences of large farm organizations, agricultural readjustments in particular industries, the farmers' income, prices of agricultural products, marketing, and the transportation of farm products by waterways, improved roads, etc. In each session the research phases of the problems were especially stressed. Representatives of the U. S. D. A. Bureau of Agricultural Economics presented papers on the methods and results of the Department's work in estimating farmers' incomes by States, in price analyses and price forecasting, and in research on the problems of handling annual surpluses of nonperishable farm products, the relation of quality and price of cotton, and the problems of the apple industry. Experiment station workers and representatives of other institutions discussed the research problems involved in providing farmers with continuous economic information, the economic aspects of the administration of groups of farms under northern conditions, the prospective displacement of the independent family in large farm or estate management and its economic and social consequences, the issues involved in farm organization readjustments in the Cotton Belt, the farmers' income and the gasoline engine, the seasonal adjustments of production and consumption in fluid milk areas, the problems of the location of country milk shipping stations, and direct-packer buying of livestock.

At one of the two round tables, papers were presented and discussed on the significance of soil type in farm economy and the methods of studying relationships involved, the scope, methods, and practical results of a regional replanning study in the mountains of West Virginia, and the problems in determining the economic feasibility of forest uses. The other was devoted to new developments in scope and methods, especially as related to the economics of consumption as a field of research in agricultural economics and home economics, a new method of measuring tenure and financial progress of farmers, and the elements of a cooperative Federal and State program for determining changes in the farm real estate situation.

Even more specifically, a luncheon session was devoted to a symposium on the experimental method in agricultural economics as discussed in the handbook of research methods and procedure referred to on page 381. The experimental methods used and results obtained by the Virginia Experiment Station in the dark tobacco area, the Kansas Station in the field of marketing, and the Montana Station in the Fairway Farms experiment with large farm organizations were described. The limitations of the method due to the practical difficulty that all conditions can not be controlled and that taking any experiment out of the highly competitive conditions surrounding all agricultural production and distribution profoundly influences results were considered by Prof. F. P. Weaver of the Pennsylvania College and Station.

Discussion of the scope, methods, and needs of research in rural sociology permeated the programs of several sections of the American Sociological Society. As has been usual in recent years, a striking and encouraging feature of all the sessions was the readiness with which those presenting or discussing papers called attention to weaknesses in their own methods, encouraged criticism and suggestions for improvements, and in general showed a desire to get the work on as high a research basis as possible.

Some of the papers outlined the studies of rural leadership and of age and sex distribution as factors in rural behavior being made by Cornell University, of the family life and rural organization by the University of Wisconsin, of community and social organization by the University of Missouri, of the type of agriculture as a factor in community organization by Ohio State University, of the influence of formal schooling upon consumption tendencies by Brigham Young University, of the attitude of Illinois farmers toward the county farm bureau by the University of Illinois, and of cotton culture and social life in institutions of the South by the University of North Carolina. Other papers discussed the case study of the farm family as a method of rural research, newspaper circulation as an index of urbanization, selective aspects of rural and urban migration, and the sources of and needs in population and farm welfare statistics. Of special interest were the presidential addresses of Dr. John M. Gillette of the American Sociological Society on Urban Influence and Selection and of Dr. Jesse F. Steiner of the National Community Center Association on An Appraisal of the Community Movement, and the papers by Dr. Charles H. Cooley on The Life-Study Method Applied to Rural Social Research and by Mr. H. B. Hawthorn on Methods of Studying Personality Development in Rural and Urban Groups. Mention may also be made of the abstract of the study of Senor Manuel Gamio on The Antecedents of Mexican Immigration into the United States presented by Dr. Robert Redfield and the companion papers of Drs. Max Handman and E. S. Bogardus on Mexican immigration from the economic and sociological points of view, presented at a joint session of the American Sociological Society and the American Farm Economic Association.

Extension and teaching phases of rural sociology were given considerable attention, one session of the rural sociology section being devoted to a discussion of the development and value of community score cards, another to the community organization work in Missouri, Ohio, and West Virginia, and a third to the content of courses in rural sociology and the laboratory use of surveys, census data, and other sources. One session of the section on education sociology was devoted to the problems of rural education demanding sociological research and some investigations into rural life with curriculum implications, and another to the rural community as a unit for rural administration and the adaptation of educational administration to rural communities.

Papers in other groups of special interest to agricultural economists and rural sociologists were those on stabilization as a necessity to agriculture in the Stable Money Association; on State supervision of local finances in the American Political Science Association; on tariff making in the United States in the American Economic Association; and on phases of religion susceptible of sociological study and on rural-urban conflict in the Chicago dairy district in the section on sociology of religion of the American Sociological Society. Still another important set of papers took up in the American Statistical Association the forecasting of hog production and marketing and of farm implement sales, economic and time-series data from the sampling point of view, and the application of theory of error to fitting trends, to simple correlation and regression coefficients, and to multiple and curvilinear correlations.

Some of these papers obviously dealt more directly with research than others, but collectively they were typical of the prevailing interest in agricultural questions and the increasing realization that the solution of many of the more urgent agricultural problems is a matter of concern not only to farmers and farming people but to all classes and conditions of men as a vital phase of the preservation of the general welfare.

The recent publication, in two volumes and 468 mimeographed pages, of the eagerly awaited handbook entitled Research Method and Procedure in Agricultural Economics has made available a timely guide which can not fail to be helpful to investigators in the social sciences, experiment station administrators, and many others. This handbook, it will be recalled, has been sponsored by the Advisory Committee on Economic and Social Research in Agriculture of the Social Science Research Council, headed by Dr. H. C. Taylor of Northwestern University.

The appointment of this advisory committee was doubtless due in part to a realization by social science workers of the fact that while scientific method in its broad outline is the same in all fields of inquiry, differences in the data obtainable necessitate differences in details of procedure. The object of the committee, it is announced, has been to "summarize as much as possible of the experience of agricultural economists in planning, organizing, and executing research in this field."

The preparation of the handbook has been in the hands of a subcommittee of four, consisting of Dr. J. D. Black of Harvard University as chairman, Dr. E. G. Nourse of the Institute of Economics, and Dr. L. C. Gray and Mr. H. R. Tolley of the U. S. D. A. Bureau of Agricultural Economics. Viewed as a whole, however, the publication is of wide authorship. In its construction there has been assembled material embodied not only in the manuscripts of the committee members but also in 38 articles by 33 other persons and many letters from correspondents, while the services of 16 persons have been utilized in reviewing and revising the different sections.

The early pages of the handbook are devoted to a discussion of what constitutes research and scientific methods, what investigations in agricultural economics can meet these requirements, and the choice, planning, and execution of projects. Much emphasis is placed upon the relative place of quantitative and qualitative analysis in economic research and on the dynamic aspect of such research. Development of technique of observation and measurement of current changes is pointed out as one of the present important research needs, and close study of current phenomena is believed probably to have more to contribute than the analysis of records of the past to the determination of the laws and principles of economic change.

The committee maintains that instead of quantitative analysis being more scientific than qualitative analysis, as is sometimes alleged, the two forms "condition and complement each other," since "quantitative analysis alone is virtually helpless [and] qualitative analysis alone is inadequate and unsafe in ordinary use." While qualitative analysis, as a sole method, is limited by the danger of overlooking or misinterpreting important factors, the committee points out that "given qualitative analysis of a high order, with rigorous definition of terms and statement and testing of conclusions, results of very great value follow." However, it finds that such analysis is not common, and "consequently for the ordinary run of research workers, it is highly necessary that data be collected and qualitative conclusions checked at every turn. Only after quantitative analysis is there any safety in the conclusions with the ordinary research worker; and even the most gifted are occasionally blind to important elements in problems."

Approximately 300 pages are devoted to a summarization of information regarding and experiences of agricultural economists with the statistical, case, informal statistical, and experimental methods, and the method of analogy, the first-named method being dealt with in considerable detail. Smaller sections discuss the presentation and utilization of results, problems of research policy, the relation of an agricultural economic research department to functional and other subject matter departments, cooperation with outside agencies, overhead organization, selection of research staff, training of graduate students, division of time between teaching and research, and other phases of organization and administration.

While the publication is not intended as a textbook on research methods it brings together a mine of information such as has seldom been assembled in any field of inquiry. Its preparation reflects much credit upon the many minds which have been associated with it, and the information included should materially assist research workers and others in organizing and directing research in agricultural economics and other fields.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Composition of bone.—III, Physicochemical mechanism, M. J. SHEAR and B. KRAMER (*Jour. Biol. Chem.*, *79* (*1928*), *No. 1, pp. 125–145*).—From a theoretical investigation, based upon their own and other recorded data, the authors reached conclusions summarized as follows:

"As a criterion for the formation of precipitates of calcium phosphates, the ion product $[Ca^{++}]^3 \times [PO_4^{\equiv}]^2$ is inadequate. We have found no evidence which satisfactorily demonstrates the presence in bones of a compound with the formula $Ca_3(PO_4)_2$. From data in the literature $pK_{s.p}$ $CaHPO_4$ is calculated to be 6.4±0.1 at 38°. At any ionic strength up to that of serum

$$pK'_{s.p}\ CaHPO_4 = 6.4 - 2.3\sqrt{\mu}.$$

The ion product $[Ca^{++}] \times [HPO_4^{=}]$ at which calcification begins, both in vivo and in vitro, is numerically equal to the value calculated for $K'_{s.p.}$ $CaHPO_4$ at the ionic strength of serum. A theoretical basis is suggested for the empirical $Ca \times P$ product. In inorganic serum solutions with a pH of 7.35

$$Ca \times P = 1.5 \times 10^7\ ([Ca^{++}] \times [HPO_4^{=}])$$

Inorganic serum solutions with empirical $Ca \times P$ products less than 30 appear to be undersaturated with respect to $CaHPO_4$; calcification is not obtained with these solutions. The evidence indicates that ricketic serum is definitely undersaturated with respect to $CaHPO_4$ and that normal serum is slightly undersaturated with respect to this salt."

On the mechanism of enzyme action.—II, Further evidence confirming the observations that ethylene increases the permeability of cells and acts as a protector, F. F. NORD and K. W. FRANKE (*Jour. Biol. Chem.*, *79* (*1928*), *No. 1, pp. 27–51, figs. 13*).—"An investigation of the physicochemical behavior of zymase solution . . . led to the result that (*a*) it is possible to prepare zymase solutions which are capable of maintaining their biological activity." Data are presented to show "that these solutions maintained their full activity even after 65 days, although it has been generally assumed that even at 0° the activity is lost within 48 hours; and (*b*) it is not only possible to maintain the full activity of such a solution for practically an indefinite period, but it was shown that the enzyme solution, which behaves as a lyophile colloid, undergoes by means of appropriate peptization a change of its surface forces," indicated by an increased surface tension and by decreased viscosity. The conclusion seems justified "that the surface energy of the colloids concerned was increased, and this was reflected in the measurable increase of carbon dioxide production which was observed when the enzyme acted upon glucose."

In a somewhat detailed discussion of the effects of ethylene the authors state further, with respect to experimental results from the treatment of enzyme solutions with this gas: "We not only could protect the increased surfaces

. . . produced by the appropriate peptization of the enzyme solution, but also found it possible to show . . . that a protecting film could be formed even on enzyme surfaces . . . within the cell."

Ethylene was found, also, to increase the permeability of single cells and of cells in tissues (fresh tobacco leaves), and the summary conclusion is stated that "enzymes outside of or bound to cells can be charged with an adsorbed film which may act as a protector against damaging transformation products."

The work is a contribution from the Minnesota Experiment Station.

The preparation of *d*-arginine monohydrochloride, G. J. Cox (*Jour. Biol. Chem., 78 (1928), No. 2, pp. 475–479*).—Following a brief critique of the more recently proposed methods for the preparation of arginine salts from protein hydrolysis products, the most recent of these procedures discussed being that of Vickery and Leavenworth (E. S. R., 58, p. 12), the author of this communication from the University of Illinois proposes "to avoid the difficulties of filtration and recovery of reagents involved in the method cited . . . and to secure a stable, pure final product" by means of "a modification of the flavianic acid method of Kossel and Gross [E S. R, 60, p. 202]."

Essentially, the process recommended consists in the hydrolysis of a good grade of gelatin by boiling 24 hours with 2.3 liters per kilogram of gelatin of concentrated hydrochloric acid, followed by evaporation of the excess acid under reduced pressure, solution of the resulting thick sirup in water, neutralization, with Congo red as indicator, with concentrated sodium hydroxide solution, and direct precipitation with 300 gm. of flavianic acid (naphthol-2, 4-dinitro-7-sulfonic acid; Naphthol Yellow S) in 1,500 cc. of water for each 1 kg. of gelatin hydrolized. The washed and dried arginine dinitronaphtholsulfonate is converted into the required arginine monochloride by first treating each 100 gm. with 200 cc. of concentrated hydrochloric acid for from one to two hours at steam bath temperature and chilling to ice chest temperature to complete the precipitation of the free dye acid, which is removed by filtration. The filtrate and washings are then concentrated to a thick sirup, taken up in 400 cc. of warmed 95 per cent alcohol, and chilled overnight to separate any remaining flavianic acid as the arginine salt.

At this point, "in the preparation of arginine monohydrochloride from solutions containing an excess of hydrochloric acid, use has been made of the convenient basicity of aniline, and the solubility of aniline hydrochloride in alcohol," the basic dissociation constants being given as

$$K_b = 4.6 \times 10^{-10}$$

for aniline, and for arginine

$$K_{b_1} = 1.0 \times 10^{-7}, \text{ while } K_{b_2} = 2.2 \times 10^{-12}.$$

"Aniline, therefore, combines with all the hydrochloric acid in excess of that united with the stronger basic group or arginine." From 75 to 80 gm. of purified arginine monohydrochloride (m. p. 216 to 217°. uncorrected) were obtained from 1 kg. of good gelatin. "The gelatin that gave most satisfactory results was an ordinary commercial product having 16.85 per cent of total nitrogen."

Report of the imperial agricultural chemist, [Pusa, 1926–27], W. H. Harrison (*Agr. Research Inst., Pusa, Sci. Rpts. 1926–27, pp. 24–33, figs. 2*).—An investigation of the comparative merits of extraction by citric acid solution and by potassium carbonate solution for the determination of available phosphoric acid led to the conclusion that since the results obtained by acid extraction, though consistent among themselves for humus and noncalcareous soils, were erratic in the cases of calcareous and alkali soils, the method of alkaline extraction, the results of which showed no irregularities among the four types of soils investigated, is probably of greater general applicability and utility.

Some results of a study of the movement of nitrates in the surface soil and subsoil are also noted.

A comparison of pH determinations as obtained by means of hydrogen electrode and colorimetric methods, C. G. Johnston (*Jour. Biol. Chem.*, *79* (*1928*), *No. 1, pp. 297–307*).—Comparisons of hydrogen-ion concentration determinations in blood sera by means of the hydrogen electrode and by colorimetric methods consisting in (1) dilution with 0.9 per cent sodium chloride before colorimetric comparison, or (2) dialysis and use of the dialysate as the actual material for the colorimetric measurement, led to the conclusions that the differences between the colorimetric readings and electrometric readings were "so variable that the colorimetric methods can not be used if accurate comparisons of individual determinations are to be made," and that "at the present time it is doubtful if colorimetric methods should be used indiscriminately on all varieties of sera without adequate checking with the hydrogen electrode. For a comparison of individual determinations . . . colorimetric methods should not be used."

The effect of the chemical nature of a decolorizer on its functioning.—II, The apparent isoelectric point, E. W. and A. E. Stearn (*Stain Technol.*, *3* (*1928*), *No. 3, pp. 87–93, figs. 2*).—Stating as a primary definition of the isoelectric point of a bacterial system that it is that point at which there is equal retention of anion and cation, and as a tentative corollary definition that a bacterial system may be regarded as isoelectric at the pH value at which there is equal retention of acidic and basic stain as against acetone as a decolorizer, the authors of this contribution from the department of preventive medicine and the division of physical chemistry, University of Missouri, show that the substitution of acidic decolorizers for acetone shifts the experimentally determined isoelectric point to the higher pH values, basic decolorizers toward the lower. "By basic decolorizer is meant, not one of high pH value, but one which will form a salt with acids, as for example pyridine or aniline."

The results are considered to indicate "an ionic chemical equilibrium as a factor in the mechanism of staining."

Composition of bone.—I, Analytical micro methods, M. J. Shear and B. Kramer (*Jour. Biol. Chem.*, *79* (*1928*), *No. 1, pp. 105–120*).—Analytical methods for the determination of carbon dioxide in 20 mg. of bone powder and for the determination in duplicate of calcium and of inorganic phosphorous in 10-mg. samples are described. "The entire procedure has been performed on as little as 17.7 mg."

The estimation of aluminum in animal tissues, V. C. Myers, J. W. Mull, and D. B. Morrison (*Jour. Biol. Chem.*, *78* (*1928*), *No. 3, pp. 595–604*).—Drawing a conclusion from a briefly noted survey of the recorded work on the determination of aluminum, especially of relatively minute quantities of the metal, that colorimetric methods, while less accurate for larger quantities, are more satisfactory for the determination of minute quantities, the authors present in detail a modification of the aurin tricarboxylic acid lake colorimetric procedure of Hammett and Sottery.[1] The essential features of the method as here proposed are (1) the digestion of the tissues with a sulfuric-perchloric acid mixture, (2) the precipitation of the aluminum together with a very small quantity of iron, found to be necessary to insure the complete precipitation of the aluminum, followed by the complete separation of the aluminum from the iron, and (3) the development of the color, which consists of the aluminum lake formed from the ammonium salt of aurin tricarboxylic acid.

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[1] Jour. Amer. Chem. Soc., 47 (1925), No. 1, pp. 142, 143.

"The method is adequate for estimating the aluminum present in tissues under various conditions, i. e., amounts varying from less than 0.01 to 0.5 mg. per 100 gm. of tissue. It is not suited to amounts of aluminum exceeding 1.0 mg. per 100 gm. of tissue. Owing to the delicacy of the method only reagents of the very highest purity can be used, but with suitable reagents and careful manipulation the error of the method should not exceed 10 per cent."

Among the precautions found necessary to avoid extraneous aluminum were the preparation of sodium hydroxide from metallic sodium (contamination was sometimes found even from this source), and the redistillation of ammonia solution after this had stood for some time in glass.

Method for the determination of urea in blood, A. K. Anderson and G. C. Romig (*Pennsylvania Sta. Bul. 230 (1928), pp. 6, 7*).—Rubber stoppers and tubes in the aeration apparatus were found capable of either absorption or evolution of ammonia with a resulting possible error of 5 or 6 mg. of ammonia nitrogen per 100 cc. of blood. An all-glass apparatus obviated this trouble, and preliminary work indicated the possibility of obtaining very satisfactory results with but 0.1 cc. of whole blood.

Lipins and sterols as sources of error in the estimation of fat in buttermilk by ether extraction methods, L. M. Thurston and W. E. Petersen (*Jour. Dairy Sci., 11 (1928), No. 4, pp. 270–283*).—Testing buttermilk for fat content by the gravimetric, the American Association, or the Gerber method was shown in experiments at the Minnesota Experiment Station to give results which are higher than the true fat content by the amount of nonsaponifiable matter and lecithin present. The Babcock test was more accurate for testing buttermilk containing roughly as much lecithin as fat. However, it does not give entirely accurate results, particularly for buttermilk containing less than 0.3 per cent fat, in which case its results are usually too low.

A comparison of the volatile-solvent method with the vacuum-oven method for determining moisture content of cheese, G. P. Sanders (*Jour. Dairy Sci., 11 (1298), No. 4, pp. 325–330, fig. 1*).—In this study by the U. S. D. A. Bureau of Dairy Industry, the author describes improvements in the technique of the volatile solvent (toluene) method (E. S. R., 57, p. 57, p. 408) of moisture determination, and compares it with the vacuum-oven method at 98 to 100° C. in determinations of a number of varieties of cheese.

It was found that toluene removes moisture rapidly without undue charring or decomposition. This method is quite rapid and very accurate for moisture determinations on cheese, but closer checks are obtained on check samples by the vacuum-oven method.

The Garrett-Overman fat test on ice cream.—A preliminary report, O. R. Overman and O. F. Garrett (*Ice Cream Trade Jour., 24 (1928), No. 7, pp. 51, 52*).—A preliminary report from the Illinois Experiment Station, giving the details of a method devised for an accurate and rapid determination of fat in ice cream, and designed to be used with the Babcock apparatus. Of 100 samples tested by this new method and checked by the Roese-Gottlieb method, 60 samples gave higher results, 36 samples lower results, and 4 samples checked exactly. For all samples the average difference between this new method and the Roese-Gottlieb method was ±0.1112, and a large part of this variation was due to 1 sample of chocolate ice cream.

METEOROLOGY

The 28-month period in solar activity and corresponding periods in magnetic and meteorological data, H. W. CLOUGH (*U. S. Mo. Weather Rev., 56 (1928), No. 7, pp. 251–264, figs. 4*).—Supplementing a paper on 28-month solar periodicities, previously noted (E. S. R., 52, p. 414), this paper presents "additional evidence regarding the 11-year and 28-month variations in the mean heliographic latitude of the spotted area and other features of solar activity."

"New determinations of the 11-year epochs of maximum and minimum magnetic declination range are given. and there are derived epochs of the 28-month variation in the range. These epochs average about 0.07 year later than the corresponding epochs for the relative numbers. An 11-year variation occurs in the length of the 28-month period in terrestrial temperatures with long and short intervals about 4 years after the Wolfer epochs of minima and maxima, respectively. The short period variations in temperature have a closer causal relation to the solar latitude than to the relative number variations. It is found from data extending over a period of 75 years that the epochs of maximum and minimum temperature occur about 1 year later than the epochs of maximum southern and northern heliographic latitude, respectively, and about 4 months before the epochs of minimum and maximum spottedness."

Monthly Weather Review, [July–August, 1928] (*U. S. Mo. Weather Rev., 56 (1928), Nos. 7, pp. 251–300, pls. 6, figs. 13; 8, pp. 301–345, pls. 13, figs. 14*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for July and August, 1928, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 7.—The 28-Month Period in Solar Activity and Corresponding Periods in Magnetic and Meteorological Data (illus.), by H. W. Clough (pp. 251–264) (see above); The Rate of Decay of Atmospheric Eddies (illus.), by L. D. Vaughan (pp. 264–274); Dense Fogs at Lincoln, Nebr. (illus.), by H. G. Carter (pp. 275–277); and Noctilucent Clouds and Unpublished Measurements of Their Velocity, by F. S. Archenhold, trans. by W. W. Reed (pp. 278–280).

No. 8.—Weather and the Cotton Boll Weevil (illus.), by J. B. Kincer (pp. 301–304) see p. 357); Methods and Results of Definitive Air-Pressure Measurements (illus.), by H. Koschmieder, trans. by W. W. Reed (pp. 305–310); Thunderstorms in the Los Angeles District, by C. C. Conroy (p. 310); The Mechanism of a Thunderstorm (illus.), by G. C. Simpson (reprint) (pp. 311, 312); The Caracoles Meteorological Station and Its Importance for the Traffic of the Transandine Railway and Aviation, by J. B. Navarrete, trans. by W. W. Reed (pp. 312, 313); Hailstones of Great Size at Potter, Nebr. (illus.), by T. A. Blair (p. 313); The Uprush of Air Necessary to Sustain the Hailstone, by W. J. Humphreys (p. 314); Note on Pilots' Observations of Air Currents in and near Thunderstorms, by P. A. Miller (p. 315); Five Years of Ocean Mapping and Its Forecast Value (illus.), by L. E. Blochman (pp. 315–317); Aerological Activities at the Naval Air Station, San Diego, Calif.; Historical Sketch, by W. G. Lindeman (pp. 318–320); and A 12-Year Record of Hourly Temperatures at Richmond, Va. (illus.), by H. A. Frise (p. 320).

Climatological summary for State College, Pennsylvania, 1927, E. S. ERB (*Pennsylvania Sta. Bul. 230 (1928), p. 47*).—A summary is given of monthly and annual temperature, precipitation, and cloudiness. The annual temperature was 50° F., 1.7° above the 43-year normal. The extremes of temperature were 94° July 13 and −4° January 27. The precipitation for the year was 48.01 in., 8.74 in. above the normal. The snowfall was 34.65 in. There were 105 clear days.

Meteorological observations at the Massachusetts Agricultural Experiment Station, C. I. GUNNESS and L. O. JONES (*Massachusetts Sta. Met. Buls. 477–478 (1928), pp. 4 each*).—The usual summaries of observations at Amherst, Mass., during September and October, 1928, are given.

SOILS—FERTILIZERS

Agricultural geology, F. V. EMERSON, rev. by J. E. SMITH (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, 2. ed., rev., pp. XVI+377, figs. 271*).—The present is similar to the first edition (E. S. R., 43, p. 719) in laying primary emphasis on the genesis of soils and in the inclusion of some account of fertilizer minerals. "A few changes of minor importance" only have been made in the original material, but some new matter, in part inserted for pedagogical reasons and including tables for the identification of minerals and rocks, has been added. Soil maps are included in an appendix.

Soil Survey of Harris County, Texas, H. V. GEIB ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1922, pp. IV+1903–1953, pls. 5, fig. 1, maps 2.*)—Harris County, in southeastern Texas, is described in this report prepared in cooperation with the Texas Experiment Station as consisting mainly of a broad, nearly level plain of an extent of 1,129,600 acres. Its major portion is open prairie, though in part, especially along some of its streams, it is heavily forested, the whole forming a part of the Coastal Plain region. The general slope is southward, mainly toward the San Jacinto River, tributaries of which constitute the principal drainage system of the county. "The prairie soils, with the exception of the rolling phase of Hockley fine sandy loam, would be greatly benefited by an adequate drainage system."

More prominent among the 30 types found in the survey and grouped in this report in 15 series are Lake Charles clay 24.6 per cent of the entire area, Lake Charles clay loam 16.8 per cent, Katy fine sandy loam 11.0 per cent, and Hockley fine sandy loam 10.2 per cent. The unclassified surface recorded consists of 0.4 per cent of tidal marsh and 0.3 per cent of made land.

Volume weight of certain field soils, M. B. HARLAND and R. S. SMITH (*Jour. Amer. Soc. Agron., 20 (1928), No. 6, pp. 533–541*).—A maximum variation of about 2,750,000 lbs. in the weight of 40 acre-in. among the soil types studied is shown in this report of an investigation by the Illinois Experiment Station of the results of the determination, by the Israelsen method (E. S. R., 39, p. 213), of 14 sets of volume weights upon 13 soil types. The extreme values, both upper and lower, were observed in silty soils. "Very sandy, light-colored soils might increase the range, and peaty soils undoubtedly would do so."

In dark-colored silty soils, the A, B, and C horizons showed a volume weight progressively increasing as the depth increased to 40 in., while sandy and light-colored soils from the same region showed decidedly greater volume weights, attributed to coarser texture and a lesser content of organic matter. No marked difference in volume weight as between silty and clayey soil sections was observed.

The more mature soils appeared heavier than the less mature, the difference here being attributed in part to a lower content of organic matter, in part also to the presence of "ashy" horizons which were observed to possess a high volume weight. "The B horizons, especially if relatively impervious, and the C horizons, for no reason which is apparent, show the same trend." More variation in weight between types was evidenced in the older and light-colored than in the less developed and dark-colored soils. Deeper horizons tended toward a volume weight greater than that of the shallower, in the case of both light and dark-colored soils, and whether the texture was coarse or fine. Clayey horizons were seemingly no lighter than the silty, probably heavier. "Sandy horizons are probably heavier than finer textured ones, though the data are not conclusive on this point."

The relative merits of various forms of volume weight determination, together with the value of the apparatus for the sampling, are discussed.

Reaction studies of Delaware soils, C. R. Runk (*Delaware Sta. Bul. 155 (1928), pp. 17, figs. 7*).—In a study of the reaction, apparent lime requirement, and buffer capacity measured as cubic centimeters of 0.01 N alkali required to carry the pH of a 5-gm. sample of the soil from pH 4.8 to pH 7.0, it is shown that lime requirement determinations "are inaccurate in as far as determining the 'acidity correction' value of lime applications upon soil is concerned." It is further stated that "Delaware soils do not appear to be sufficiently acid to injure the growth of most crops. The value of lime applications upon these soils appears to lie in some factor other than that of acidity correction."

Statistical information secured in the study included the classification of the 264 fields examined into four groups, 17 having pH values between 5.0 and 5.5, 112 between 5.5 and 6.0, 124 between 6.0 and 6.5, and 8 between 6.5 and 7.0; and the buffer capacities for each of the 29 types included in the investigation ranging from 0.44 for Norfolk loamy sand to 7.16 for Portsmouth sandy loam, these figures having been obtained by the method above indicated.

"An application of 1 ton of burned lime to correct acidity, or an application of 500 lbs. of sulfur to control the potato scab organism, may produce a hydrogen-ion concentration unfavorable for crop growth on the sands, loamy sands, and sandy loams. These types of soil, as represented by the samples tested, have very low buffer capacities and consequently the hydrogen-ion concentration may be easily changed. Similar applications of lime or sulfur might be made on the soils of high buffer capacities without producing hydrogen-ion concentrations unfavorable for crop growth. Obviously, since there are such great differences in buffer capacities of soils, it would seem necessary to know the buffer capacity before applying materials which affect soil reaction."

On the oxidation of cellulose in the soil [trans. title], **S. Winogradsky** (*Compt. Rend. Acad. Sci.* [*Paris*], *187 (1928), No. 6, pp. 326–330*).—The cultural characteristics of three types of cellulose-decomposing organisms, of which the first, exemplified by an organism described as a pale yellow vibrio, causes a yellow coloration of filter paper spread on silica gel and impregnated with a nutrient solution but produces no evident textural alteration, while the second type, not here given a generic designation, brings about swelling of the paper, sliminess, and disintegration with or without coloration, and the third, assigned to Cytophaga, reduces the fibers of the paper to a gelatinous and transparent consistency.

With respect to the chemical effect of the growth of these groups of organisms in the soil, the author's conclusion may be translated: "Finally we should note the fact that the oxygen-saturated products resulting from the activity of these bacteria are extremely resistant to the attack of a very large majority of the microorganisms of the soil. It is probable, therefore, that they remain for a long time components of the organic colloids of this medium."

Notes on Protozoa in the soil, M. Shibuya (*Imp. Acad.* [*Japan*], *Proc., 3 (1927), No. 6, pp. 384, 385*).—Inoculating 100-cc. portions of various culture media with from 10 to 20 gm. each of field soils obtained from various stations, the author of this note from the Imperial Agricultural Station at Tokyo isolated 12 Ciliate, 10 Flagellata, 2 Rhizopoda, and 1 Sactoria species. The genera Amoeba, Monas, Bodo, Cercomonas, and Colpoda were common in the majority of samples and were the most abundant in number of individuals.

The medium consisting of 100 cc. of a 2 per cent infusion of timothy hay with the addition of 3 cc. of egg albumin and 0.75 gm. of sodium chloride proved the most satisfactory of the mixtures used. "The pasture hay infusion with or without egg albumin" was less satisfactory.

Certain factors influencing the staining properties of fluorescein derivatives, H. J. CONN and W. C. HOLMES (*Stain Technol., 3 (1928), No. 3, pp. 94–104*).—In a similar contribution to this subject, noted from another source (E. S. R., 60, p. 20), the authors have presented essentially the technique here proposed for the use of calcium salts to intensify stainings with fluorescein dyes. They show in the present paper tabulated detail of the results obtained with eosin Y, phloxine, erythrosin, and rose bengal in the presence of barium, magnesium, aluminum, and lead salts, respectively, in addition to the calcium salt tests, the material stained consisting of bacteria in films of soil fixed in gelatin, as in the work above cited. The tables show the character of the staining secured in each combination among the four dyes and the four groups of metallic salts considered.

Apparatus for growing plants in soil under microbiologically controlled conditions, E. P. DEATRICK (*Jour. Amer. Soc. Agron., 20 (1928), No. 6, pp. 643–645, fig. 1*).—A simple apparatus, providing for the covering and irrigation with sterile water of potted soil and for the growth of the plant and the sampling of the soil without the admission of contaminating organisms, is here briefly described from the West Virginia Experiment Station and illustrated by a drawing and photograph.

Results of eight years of soil fertility studies on Volusia and Westmoreland soils, J. W. WHITE and F. D. GARDNER (*Pennsylvania Sta. Bul. 230, (1928), pp. 14, 15*).—The more important of eight years' results are summarized.

A fairly close correlation was found to exist between the chemical composition of the two soils and their relative response to nitrogen, phosphorus, potash, and lime. The percentage increase on Volusia soil due to applications of lime was 63, compared to 17 on Westmoreland soil. (The latter soil contains 3,900 lbs. per acre more lime and magnesia than the former.) Phosphorus had a crop-producing value of 37 on Volusia soil compared to 70 on Westmoreland soil. (The Volusia soil contains 700 lbs. per acre more phosphoric acid and more than twice as much available phosphorus as the Westmoreland.) Potash had a relative value (in the grain rotation) of 52 on Volusia soil, compared to 13 on Westmoreland soil. (The Westmoreland soil contains 9,700 lbs. per acre of potash (K_2O) in excess of the Volusia soil and appreciably more replaceable potash.) The use of soluble nitrogen gave no increase in yields on Volusia soil (grain rotation) and 18 per cent increased yields on Westmoreland soil. (The nitrogen content of the Volusia soil is 2,280 lbs. per acre in excess of the Westmoreland soil.)

"From the standpoint of the dairy industry on Volusia soil, the rotation of oats, hay, silage corn, and buckwheat has been more profitable than the rotation of corn (for grain), oats, wheat, and hay. The substitution of buckwheat for wheat and silage corn for husking corn insures, under average soil and climatic conditions, a more profitable cash crop and a greater supply of winter feed.

"In the production of profitable pastures, lime and manure or lime and mineral fertilizers are essential.

"The production of corn for grain on Volusia soil has been successful only on plats liberally supplied with mineral plant food or manure. The proportion of soft corn has been greatly reduced by liberal fertilization on limed land.

"The varieties of the several grain crops found suitable for Bradford County are Northwestern Dent or Wisconsin 25 for corn grain, West Branch White Cap for silage corn, Patterson oats, and Pennsylvania 44 wheat."

The chemical effect of gypsum, sulfur, iron sulfate, and alum on alkali soil, W. P. Kelley and A. Arany (*Hilgardia* [*California Sta.*], *3* (*1928*), *No. 14*, *pp. 393–420*).—This paper is concerned with reclamation experiments on land in which the alkali soil characteristics have developed since 1890 in consequence of seepage and poor drainage, and which had been unsuccessfully leached by flooding for about two months in 1914 and again in 1915. The soil had shown so high a toxicity when the experiments were begun that plantings of barley and alfalfa had failed to germinate over a large part of the experimental area. "The soil is a fine sandy loam, the upper horizon of which contains a small but variable amount of calcium carbonate."

The effects of the treatments mentioned on the soluble salts, on the insoluble carbonates, and on the replaceable bases, among which special attention was given to calcium and magnesium extraction by ammonium chloride solution, constitute the principal subjects of the data and discussion presented. The results showed "that under the influence of the treatments that have been applied, this soil is being transformed into a normal soil, although the transformation has not yet become complete," the observed changes having included "a substantial reduction in the content of soluble carbonate, the replacement of a considerable part of the replaceable sodium by divalent base (probably calcium), and a material reduction in the OH-ion concentration."

It is further considered that under careful management of drainage conditions and irrigation practice "the products of biological agents, acting on the calcium carbonate of the soil, will gradually bring about a further replacement of sodium by calcium, and good drainage conditions will make it possible to leach away the soluble sodium salts that are formed."

The paper also includes a somewhat extended discussion of the theoretical considerations underlying the reclamation of alkali soils.

Aluminum toxicity, F. T. McLean and B. E. Gilbert (*Plant Physiol.*, *3* (*1928*), *No. 3*, *pp. 293–302*).—Aluminum in true (dialyzable) solution in liquid plant culture media at pH values sufficiently high (pH 6.5+) to eliminate acidity from consideration as a toxic agent was obtained in the experiments recorded in this contribution from the Rhode Island Experiment Station by making use of the ability of citrates and tartrates to prevent at relatively high pH values the precipitation of metal ions. This made possible an experimental demonstration of the much discussed question, Is the apparent toxicity of aluminum, in soils acid enough to carry it in solution, true aluminum toxicity or an effect of toxic acidity?

"Twenty-five cc. each of nutrient solutions containing all of the usual salts and in addition 0.24 N aluminum citrate, were placed in 3 dialysis thimbles impregnated with pyroxylin, and each immersed in 200 cc. of distilled water for 7 days. The acidity of the solutions placed inside the thimbles was pH 6.5. Five times as much aluminum diffused . . . as remained behind in the thimbles. . . . Aluminum citrate diffuses readily at pH 6.5 and is in true solution not colloidal." In solution culture experiments it was then demonstrated that "aluminum as citrate is toxic even in solutions with very low acidity, pH 6+."

It was further shown (1) that even when present in a "nondiffusible, colloidal form," aluminum was toxic when in contact with barley roots; (2) that soluble phosphate, in concentrations equivalent to those of aluminum, completely counteracted the toxicity of the aluminum; and (3) that from 3 to 13 parts per million of aluminum constituted a stimulating dose for the plants, toxicity appearing at about 16 parts per million.

The work is in extension of a previous investigation (E. S. R., 58, p. 121).

AGRICULTURAL BOTANY

Some phases of nitrogen metabolism in polyanthus narcissus (Narcissus tazetta), G. T. Nightingale and W. R. Robbins (*New Jersey Stas. Bul. 472 (1928), pp. 32, figs. 14*).—On account of the ease with which the inactive bulb scales, growing centers of the bulbs, and the roots can be separated for analysis, the authors chose the paper-white narcissus for studies on nitrogen metabolism in the plant. Groups of bulbs were grown under varying conditions, and at intervals lots were analyzed for their carbohydrate and nitrogen contents. In addition, microchemical examinations were made of the various parts.

The authors found that the roots of the paper-white narcissus appear to be the chief organs concerned with the transformation of nitrates to organic nitrogen. Within the roots, nitrates were apparently reduced to nitrites and ammonia, accompanying which there was oxidation of reducing sugars, and a decrease in the percentage and absolute amount of higher carbohydrates, not only in the roots but in the storage tissues as well. As a direct or indirect result of nitrate assimilation there was found to be an increase in absolute amount of total organic, protein, proteose, basic, amide, and amino nitrogen in the bulbs while in darkness.

In one series of bulbs much of the nitrogen for new growth of centers and tops was newly synthesized from nitrates, whereas in another group the sole source of nitrogen for new growth was derived from the breaking down of more or less complex organic nitrogenous materials of the storage tissue, yet the quality of nitrogen in the centers and tops was about the same in both cases. The comparatively active centers or centers and tops of the paper-white narcissus were found to be relatively high in the simpler carbohydrates and the less complex forms of organic nitrogen, whereas the storage tissue had relatively much nitrogen in the form of protein and carbohydrates in the form of starch and dextrin.

Bulbs with a low initial nitrogen content after transfer from darkness to light were found to bloom earlier as the result of nitrate applications, whereas other bulbs shifted from darkness to light were delayed in time of blooming by the addition of nitrates to the nutrient medium.

Response of oats and soybeans to manganese on some Coastal Plain soils, L. G. Willis (*North Carolina Sta. Bul. 257 (1928), pp. 13, figs. 6*).—The occurrence of barren or unproductive spots with fairly sharply defined boundaries is reported in various soil types in the lower Coastal Plain of North Carolina. Many of these areas had been limed on the supposition that such treatments would remedy the condition. On some such areas there were undertaken field experiments with soy beans and pot experiments were conducted with oats in which manganese was added to the soil.

Where manganese sulfate was applied to the soil the chlorotic condition of soy bean plants was quickly corrected and normal growth restored. The treatments were without effect on corn planted with the soy beans. Chlorosis similar to that responding to manganese treatments had been considered evidence of potash deficiency, since potash fertilization had been found an effective remedy. The prevalence of this type of chlorosis on soils having poorly drained or impervious subsoils is taken by the author to indicate that the comparative immunity of crops on other soil types may be due to greater root development into the more penetrable lower horizons.

In the pot experiments with oats, lime was added to the soil samples from unproductive spots. It was found that injury caused by applications of lime or calcium phosphate to a soil which was deficient in manganese for soy beans can be prevented by the addition of manganese sulfate.

Carbon dioxide in relation to glasshouse crops.—Part III, The effect of enriched atmospheres on tomatoes and cucumbers, O. Owen, T. Small, and P. H. Williams (*Ann. Appl. Biol., 13* (*1926*), *No. 4, pp. 560–576, figs. 2*).—Work said to have been completed by the end of 1922 of determining the amount of carbon dioxide which normally exists within glasshouses and its variations under working conditions, also that of devising methods to secure any required concentration of carbon dioxide, has been described and noted (E. S. R., 52, p. 327). The main problem is concerned with the effect of enriched atmospheres on the marketable crops, but the effects of temperature, ventilation, and time of day have also received consideration.

In this work as described it was shown that the germination rate of tomato seeds is practically unaffected when the seed boxes are exposed to atmospheres enriched with carbon dioxide. Increases of more than 20 per cent in marketable tomato crops result when the plants are subjected to atmospheres containing 0.6 per cent of carbon dioxide for 1 or 2 hours daily. Cucumbers treated with atmospheres containing 0.9 per cent of carbon dioxide for 1 hour daily made a crop increase of 16 per cent. In the case of the 1925 tomato crop, and to a lesser degree of the 1924 crop, a considerable part of the increased picking was manifested in June, when market prices were high. As regards its effect on the crop, carbon dioxide generated slowly at the soil surface is not as beneficial as when generated quickly and mixed with the air surrounding the plants.

Plants grown in houses which have been used for carbon dioxide experiments showed an increased susceptibility to *Colletotrichum atramentarium*.

A loss of carbon dioxide always occurs when the gas is generated quickly in a house. The loss appears to be independent of temperature and to vary directly with the amount of ventilation. The apparatus devised for experimentation on a commercial scale proved to be inadequate.

Studies on the growth of root hairs in solutions, I–VI, C. H. Farr (*Amer. Jour. Bot., 14* (*1927*), *Nos. 8, pp. 446–456, fig. 1; 9, pp. 497–515, fig. 1; 10, pp. 553–564, figs. 2; 15* (*1928*), *Nos. 1, pp. 6–31, figs. 6; 2, pp. 103–113, figs. 5; 3, pp. 171–178, pls. 3*).—Papers dealing with root-hair elongation have been published by the author and by Jeffs (E. S. R., 55, p. 727). Investigations of this type are expected to furnish knowledge of value regarding the effects of nutrient constituents of the soil and of the culture media, also regarding the developmental physiology of plants.

In the first paper of this series is presented a description of the author's method of investigating root hairs and a summary of previous knowledge as to their composition, structure, and behavior. In the next two papers, the effects of different concentrations of three calcium compounds (nitrate, chloride, and hydroxide) are compared. In the fourth paper, the results are presented of an intensive study of the effects of molar and H-ion concentrations upon the growth rate of root hairs in calcium chloride solutions, in which it is shown that on the pH scale certain critical points, namely, the median minimum, the alkaline optimum, the acid optimum, the alkaline limit, and the acid limit, vary with the molar concentration of the salt. In the fifth paper, data are presented in mathematical form as to certain features of roots and root hairs in solutions of calcium chloride and calcium hydroxide, varying in molar and H-ion concentrations, these features including the length, diameter, and spacing of roots or root hairs or their parts. In the sixth paper are described certain morphotic features which do not lend themselves readily to mathematical treatment. Results of the work in its several phases are detailed in 59 separate sections.

Studies of bacterial cataphoresis (*Pennsylvania Sta. Bul. 230 (1928), pp. 6, 26*).—Studies were made on the accuracy of the method, effect of frequent transplanting on the change in charge, effect of storage of bacterial suspensions on the charge, the effect of ultra-violet light on cataphoretic velocity, and the relationship between the amount of electrical charge and the nodule-forming ability of *Rhizobium leguminosarum*. It was found that irradiating for one hour at room temperature and approximately 15 in. produced a moderate reduction of velocity and that irradiating for shorter periods had a lesser, though distinct, effect.

Experiments of R. P. Tittsler with 15 strains of the organism showed that all strains did not carry the same quantity of electric charge. In all cases where the inoculating ability of the strains was known there was a direct parallelism between the quantity of the charge and the inoculating ability. It is believed that this method should afford a rapid means of selecting strains to be used for seed inoculation.

The influence of chilling, above the freezing point, on certain crop plants, J. P. F. SELLSCHOP and S. C. SALMON (*Jour. Agr. Research [U. S.], 37 (1928), No. 6, pp. 315–338, pl. 1, figs. 8*).—The authors investigated the effect of temperature near, but above, the freezing point on certain crop plants, and where injury was found to occur studies were made as to the susceptibility of the plants and the circumstances under which injury took place.

In most summer crop plants serious injury may occur when the plants are subjected to chilling, even though the temperature does not go as low as 0° C. One of the outstanding results of the investigation was the very evident effects of chilling on certain plants and the high degree of resistance in others. The duration and the intensity of the cold were important factors in determining the nature of the reactions, and an exposure of 24 and 36 hours at from 0.5 to 5° was fatal to rice, velvet beans, and cotton. With the same exposure cowpeas were defoliated, and only straggly plants were produced. Peanuts, Sudan grass, and teff grass exposed to chilling temperatures for 48 hours appeared at first to be uninjured, but died in about 2 weeks. At the same exposure maize, sorghums, watermelons, and pumpkins were slightly injured. Soy beans, potatoes, buckwheat, tepary beans, tomatoes, and flax proved exceedingly hardy. Exposures of them to chilling temperatures for from 84 to 96 hours were made without injury. Velvet beans and cotton proved hardier than Whippoorwill cowpeas.

Marked differences in relative hardiness were observed between varieties of cotton, cowpeas, peanuts, rice, and soy beans. The characteristic reactions of the different species of plants to chilling are described. Some plants were found to be more severely injured in wet than in dry soil, while others behaved in a contrary manner. In the case of cowpeas, cotton, and velvet beans, the young plants suffered more than old plants treated in a similar manner.

Experiments were conducted to determine whether salts supplied to the plants in solutions exerted any protection against injury. Potassium nitrate was found to afford considerable protection, with potassium chloride ranking next in order. Sodium nitrate and sodium chloride were, in some cases, injurious when chilling was continued for from 36 to 60 hours. Calcium appeared to exert no protective influence, while sodium had a decidedly deleterious effect. Less injury occurred in the presence of chlorides than when nitrates were used, except in the case of potassium nitrate.

The natural healing of wounds on trees, J. H Priestley (*Jour. Min. Agr. [Gt. Brit.], 33 (1926), No. 3, pp. 248–254*).—From the standpoints attained in studies with potato tubers previously noted (E. S. R., 55, p. 231), it seemed desirable to reexamine the natural healing process that gradually builds up a protective barrier at the exposed surface of a woody branch when this is cut or broken. Attention is given to natural healing in early and in late summer or in winter, also to the relation of the block to the entry of disease-producing organisms.

"The natural healing of the exposed surface is, of course, only one factor to be considered in choosing the time for pruning, others are the habits of the most prevalent wound parasites, the cultural purposes for which the cut has to be made, the availibility of labor, and so on. In so far, however, as this particular factor can be considered in practice, the rapidity of the first stages of natural healing during the late spring and early summer months argues strongly in favor of carrying out such operations as pruning during these months."

Classification of plants on the basis of parasitism, P. A. Young (*Amer. Jour. Bot., 14 (1927), No. 8, pp. 481–486*).—"The rapidly expanding field of plant parasitology increases the need of a classification of parasites. . . . The necessity for securing greater clearness of understanding and description of parasitism is the purpose of this compilation. . . . Parasites are here grouped according to analogies in their life cycles and in the type and degree of their parasitism; phylogeny is not considered. The general arrangement of the groups is based on their specialization in parasitism. The names of some organisms are given to exemplify the classes of parasites. . . . This physiological classification is based on the following definition of a parasite: A parasite is an organism which lives in or attached to some other species of living organism from which it secures part or all of its food material in the form of living matter."

Plants are classified as nonparasitic organisms, commensals, xenoparasites, reciprocal parasites, facultative parasites, facultative saprophytes, facultative autophytes, partial parasites, and obligate parasites. These classes are exemplified, with a brief discussion of the forms thus used.

Relations between Pinus sylvestris and Boletus granulatus [trans. title], J. Constantin and L. Dufour (*Ann. Sci. Nat., Bot., 10. ser., 9 (1927), No. 1, pp. 271–280, figs. 2*).—A study suggested by some results and observations previously noted (E. S. R., 51, p. 227) is reported as largely inconclusive.

Plant material introduced by the Office of Foreign Plant Introduction, Bureau of Plant Industry, January 1 to March 31, 1926 (*U. S. Dept. Agr., Inventory 86 (1928), pp. 52*).—Economic notes are given of nearly 1,000 introductions of economic plants secured for testing in the United States.

GENETICS

Mendelism, R. C. Punnett (*London: Macmillan & Co., 1927, 7. ed., [rev.], pp. XV+236, pls. 9, figs. 53*).—This is a revised edition of the book previously noted (E. S. R., 25, p. 573).

[Genetics studies at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 230 (1928), p. 18*).—In these studies J. P. Kelly and H. A. Wahl, working with

Phlox drummondii, found that fasciation of stems was due to a single recessive factor inherited in strict Mendelian order. The diploid number of chromosomes in *P. drummondii* and 8 other species of phlox was established as 14. Irregularities observed in the reductional division of the microspore mother cell and also a tendency to inequality in the number of chromosomes in the two secondary microsporocytes were found by J. B. Hill in a study of the causes of sterility in Digitalis species hybrids.

The cytology of Oenothera, R. R. GATES (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1928, vol. 4, pp. 401–492, figs. 39*).—Investigations into the cytology of Oenothera are reviewed under the topics of chromosome numbers, somatic mitosis and somatic chromosomes, meiosis, megaspore and embryo sac formation, fertilization, seed development, apogamy, the pollen and pollen tubes, tetraploidy and triploidy, trisomy, chromosome linkage, and parallel mutations. One hundred and seventy-one titles are listed.

Number and behavior of the chromosomes in Cavia cobaya (the common guinea pig), M. T. HARMAN and F. P. ROOT (*Biol. Bul. Mar. Biol. Lab., Woods Hole. 51 (1926), No. 2, pp. 73–84, pls. 2*).—In studies at the Kansas Experiment Station, cytological investigations of the chromosomes of the testes of two male guinea pigs have shown 38 spermatogonial chromosomes, of which 8 are distinctly U-shaped and 28 are slightly bent rods of various sizes, while the remaining 2, designated as the XY pair, are unequal in size and irregular in shape. Primary and secondary spermatocyte cells have 19 chromosomes. Actively dividing cells in the seminiferous tubules were limited to elliptical areas, never exceeding two-thirds of the circumference of the tubules.

On the existence of two chromosome numbers in a mixed rat strain, O. SWEZY (*Jour. Expt. Zool., 51 (1928), No. 2, pp. 135–161, pls. 2, figs. 6*).—A more detailed account of the investigations of the chromosome counts of mixed strains of rats, previously noted from the California Experiment Station (E. S. R., 59, p. 725), in which diploid numbers of 42 and 62 chromosomes were observed with the formation of gametes containing 21 and 31 chromosomes from strains showing both diploid counts.

The nature and significance of mutations in present day breeding methods, R. J. GARBER (*Sci. Agr., 9 (1928), No. 3, pp. 133–143*).—This contribution from the West Virginia Experiment Station discusses chromosomal aberrations and their significance, gene changes, and mutations in their relation to current plant breeding methods.

Genetics and cytology of partially and completely sterile cereal hybrids [trans. title], H. BLEIER (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1928, vol. 4, pp. 321–400, fig. 1*).—Inheritance and cytological phenomena observed in hybrids involving einkorn, emmer, spelt, and other species of Triticum, rye, and aegilops in various combinations are reviewed from the 182 papers listed.

A genic disturbance of meiosis in Zea mays, G. W. BEADLE and B. MCCLINTOCK (*Science, 68 (1928), No. 1766, p. 433, fig. 1*).—In studies at Cornell University the occurrence of male-sterile corn plants in material from 30 or more unrelated cultures suggested the possibility of several genetic factors causing such sterility. "With regard to at least one male-sterile culture, it may be stated that male sterility is due to a simple Mendelian gene affecting synapsis and consequent meiotic behavior, the result being the formation of gametes containing varying chromosomal complements, only a few of which are viable."

The intensive production of single crosses between selfed lines of corn for double crossing, F. D. RICHEY (*Jour. Amer. Soc. Agron., 20 (1928), No. 9, pp. 942–946, figs. 2*).—Under rather unfavorable conditions slightly more than 12 hours, distributed over 11 days and devoted to hand pollination in a plat of corn 600 sq. ft. in area, sufficed to maintain the parent strains and produce seed of single crosses enough for the production of about 200 bu. of double-crossed seed corn.

A genetic recombination for the expression of awns in wheat, G. Stewart and D. C. Tingey (*Amer. Nat., 62 (1928), No. 683, pp. 532–539, fig. 1*).—The essentials of this article have been noted from another source (E. S. R., 59, p. 622).

Yellow seedlings in wheat, J. B. Harrington and W. K. Smith (*Sci. Agr., 9 (1928), No. 3, pp. 147–153*).—The occurrence of chlorophyll deficient seedlings in the F_2 of Khapli emmer×Early emmer at the University of Saskatchewan seemed due to two recessive genes, *a* and *b* for inhibition of chlorophyll development, borne by Khapli and Early emmer, respectively. When these are present in homozygous condition, the seedlings are yellow. Less than the expected number of yellow seedlings appeared in both F_2 and F_3. The yellow seedling developed some chlorophyll in the greenhouse, particularly where the intensity and duration of light were the least.

The genetics of the genus Linum, T. Tammes (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1928, vol. 4, pp. 1–36*).—The inheritance studies reviewed dealt with both homostyled and heterostyled species. The chromosome numbers are tabulated for 19 species, and a bibliography of 79 titles is appended.

The genetics of the genus Nicotiana, E. M. East (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1928, vol. 4, pp. 243–320, figs. 2*).—This résumé of genetic investigations in Nicotiana discusses the observations reported from many studies concerned with the chromosome numbers, the interspecific and intraspecific hybrids, and the relationships of species of Nicotiana. The bibliography embraces 207 titles.

Polyploid hybrids of Raphanus sativus L.×Brassica oleracea L., G. D. Karpechenko (*Ztschr. Induktive Abstam. u. Vererbungslehre, 48 (1928), No. 1, pp. 1–85, pls. 3, figs. 40*).—An extended account of studies at the Institute of Applied Botany, Detskoe Selo, Union of Socialistic Soviet Republics, upon crosses between the common radish (*R. sativus*) and the cabbage (*B. oleracea*), both species with 18 diploid chromosomes. In the F_1 generation certain pure breeding polyploid forms were obtained which because of their morphological peculiarities, their constancy, normal meiosis, fertility, and difficulty in crossing back to either parent are suggested as new species obtained as a result of hybridization.

The genetics of canary birds [trans. title], H. Duncker (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1928, vol. 4, pp. 37–140, figs. [12]*).—The author briefly reviews the present information on the inheritance of characters in canary birds, pointing out the genetic relations between the different varieties based on the work of various investigators.

The genetics of mice [trans. title], L. Cuénot (In *Bibliographia Genetica. The Hague: Martinus Nijhoff, 1928, vol. 4, pp. 179–242*).—The literature is reviewed with reference to methods of breeding, the number of chromosomes, the non-Mendelian factors for color and morphological variations, cancer, linkage of factors, possible genotypes, and other problems relating to inheritance in mice.

Colour inheritance in sheep.—III, Face and leg colour, J. A. F. Roberts (*Jour. Genetics, 19 (1928), No. 2, pp. 261–268*).—In continuing this series (E. S. R., 56, p. 818), the author has separated the variations in the face color of sheep into three groups, namely, (1) those showing variations in the relative proportion of pigmented and nonpigmented areas and their distribution, (2) variations in dilution, and (3) variations in grades of completeness of restriction of pigment in white sheep. An example of the first type is found in crossing the Suffolk and Dorset Horn breeds, and the results are explained on the basis of a two-factor difference, the homozygous dominant individuals being black, the homozygous recessives white, and all others showing speckled faces or patterns.

The sex chromosomes, F. SCHRADER (*Die Geschlechtschromosomen. Berlin: Borntraeger Bros., 1928, pp. IV+194, figs. 43*).—The author has collected available information from the literature on the sex chromosomes, primarily from the viewpoint of the cytologist, taking up the review under such headings as nomenclature, morphology, heteropycnosis, secretion, size of spermatozoa as related to sex chromosomes, synapsis, sex chromosomes and sex determination, parthenogenesis, and a review of sex chromosomes in the different zoological groups. This monograph is printed in English, with a German title.

Genetic studies in poultry.—I, The sex ratio in the domestic fowl, W. V. LAMBERT and C. W. KNOX (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 51 (1926), No. 4, pp. 225–236*).—The sex ratio of 2,910 chicks and embryos selected from the F_1, F_2, and back-cross generations of crosses between the Rhode Island Red, White Leghorn, Black Langshan, White Plymouth Rock, and Buff Orpington breeds was 51.13 per cent. For live chicks the sex ratio was 50.97 per cent and for embryos dying between the eighteenth and twenty-first days of incubation 50.06 per cent. For those dying between the twelfth and eighteenth days it was 55.82 per cent. The correlations were less than their probable error between sex ratio and mean individual egg weight, antecedent egg production, and actual egg production during the hatching season.

Complete sex-reversal in the viviparous teleost Xiphophorus helleri, J. M. ESSENBERG (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 51 (1926), No. 2, pp. 98–111*).—Two cases of complete sex reversal in the adult *X. helleri* are described. Both fishes gave birth to normal young before reversal, and both fertilized virgin females which gave birth to young with typical sex ratios. Sex is considered to be controlled by the sex hormones, not by the chromosomes.

Scrotal replacement of experimental cryptorchid testes and the recovery of spermatogenetic function (guinea pig), C. R. MOORE (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 51 (1926), No. 2, pp. 112–128, figs. 5*).—Guinea pig testes elevated from the scrotum to the abdomen shortly after birth retain an undifferentiated character practically throughout life, but replacement of such testes in the scrotum was followed by normal activity and differentiation of spermatozoa in 8 of 9 cases so treated.

The fate of the germinal epithelium of experimental cryptorchid testes of guinea pigs, W. LAWRENCE (*Biol. Bul. Mar. Biol. Lab.. Woods Hole, 51 (1926), No. 2, pp. 129–152*).—The desquamation and degeneration of the germinal epithelium of the testes of the guinea pig which are retained in the abdomen are described. Data are also given on the longevity of spermatozoa in the male genital tract.

Compensatory hypertrophy of the testes in Brown Leghorns, L. V. DOMM and M. JUHN (*Biol. Bul. Mar. Biol Lab., Woods Hole, 52 (1927), No. 6, pp. 458–473*).—The effects of unilateral castration of Brown Leghorn cockerels at 1 week, 16, 24, and 32 to 40 weeks on the compensatory hypertrophy of the opposite testicle were investigated. Unilateral castration at 1 week caused hypertrophy of the left retained gonad only, after a period of 31 weeks, while unilateral castration at the other ages caused hypertrophy of the remaining testicle, the left gonad, however, showing a greater tendency toward hypertrophy than the right. There was also an indication that the left gonad was normally heavier than the right in very young birds, but this difference was gradually shifted so that the right testis was heavier when the birds reached maturity.

It is concluded that the general bodily metabolism favors the growth of a definite amount of gonad tissue and no more, but unilateral castration at a very early age resulted in a single testis greater in weight than a normal pair.

Studies on suprarenal insufficiency.—I, The effect of suprarenal insufficiency on reproduction and the oestrous cycle in the albino rat, L. C. Wyman (*Amer. Jour. Physiol., 86 (1928), No. 3, pp. 528–537*).—Studies on the effect of double suprarenalectomy on female rats showed that this operation resulted in an inhibition of ovulation, due probably to indirect effects on the rate and nature of metabolism.

Activity studies on castrated male and female rats with testicular grafts, in correlation with histological studies of the grafts, C. P. Richter and **G. B. Wislocki** (*Amer. Jour. Physiol., 86 (1928), No. 3, pp. 651–660, figs.* 2).—Castration of male and female rats was found to result in a marked decrease in their voluntary activity, but the amount of activity in such animals was considerably increased by implantation of testes, and in all animals in which increases resulted large grafts developed. On microscopic study the grafts were not absolutely normal, though the increase in activity was in direct proportion to the state of preservation of the graft. The interstitial tissue appeared to be important in increasing the activity of the animals.

A Drosophila mosaic, probably due to dispermic fertilisation, G. Bonnier (*Jour. Genetics, 19 (1928), No. 2, pp. 257–260, fig. 1*).—The author describes a peculiar type of mosaic individual which, from the nature of the cross involved in its production, is explained either as the result of a supernumerary sperm fertilizing a polar body or a supernumerary sperm developing without fertilization.

FIELD CROPS

Types of field and plat in crop tests, G. H. Stringfield (*Jour. Amer. Soc. Agron., 20 (1928), No. 10, pp. 1073–1096, figs. 15*).—An inquiry at the Ohio Experiment Station dealt with the effects on deviation from varying the size of planting or total test area and also the reliability of several plat types differing from each other in size and shape.

When an area about 3 rods square had been covered, the size of blocks in oats and wheat nursery plantings had only a slight influence in increasing the standard deviation of single rod-row plats. Increase in the size of field tests was accompanied by a slight increase in the standard deviation of the plats where additions caused the field to approach a square, and by a rather large increase where rectangular ranges were lengthened. In small grain nursery plats, increasing the length was found distinctly of more advantage than widening the plat. Standard deviation was rapidly reduced by lengthening single row nursery plats up to 4 or 5 rods. No single nursery plat appeared as reliable as the same area devoted to replicated smaller plats, this observation likewise applying to field plats. From two to nearly three single row 1-rod plats were needed to attain the same reliability as one single row 3-rod plat. When the tendency of 22 wheat varieties to depart from their average ranks over a 5-year period was used as a means of comparison, the variation from average rank for the field plats was probably not significantly lower than that for the nursery type. Comparing $\frac{1}{100}$- and $\frac{1}{10}$-acre field plats for variation, the results seemed to favor the $\frac{1}{100}$-acre when difference in size was considered. It was noted that $\frac{1}{80}$-acre plats were somewhat lower in standard deviation than $\frac{1}{100}$-acre plats. Increasing the size of field plats by adding to the sides was not so effective in reducing variations as was lengthening the plats.

Systematic laboratory studies of field crops and weeds, C. A. MICHELS (*Philadelphia: Lea & Febiger, 1928, pp. VIII+17–298, figs. 21*).—Laboratory exercises are outlined for the study of the more important field crops and weeds.

[Agronomic work in the Philippine Islands], S YOUNGBERG (*Philippine Bur. Agr. Ann. Rpt., 27 (1927), pp. 25–31, 37–40, 52–55, pls. 9*).—Cultural, varietal, and fertilizer trials with corn, rice, sugar cane, tobacco, and abaca and tests with miscellaneous cereal, forage, and fiber crops are reviewed as heretofore (E. S. R., 58, p. 429).

[Agronomic experiments in Pennsylvania], D. E. HALEY, O. OLSON, J. W. WHITE, F. D. GARDNER, and C F. NOLL (*Pennsylvania Sta. Bul. 230 (1928), pp. 7, 12–14, 15, fig. 1*).—On a 3-year and a 4-year rotation at Ephrata, complete fertilizer with 10 tons of manure gave 444 and 399 lbs. more cured leaf tobacco per acre than manure alone, and with continuous tobacco the fertilizer made 400 lbs. more than no fertilizer. These increases in yield were more than enough to pay for the fertilizer, and the use of fertilizers apparently improved the burn, taste, flavor, and aroma of the leaf. In cooperative tests high grade fertilizers costing $35 made 82 lbs. of leaf per acre more than 15 tons of manure valued at $67.50 per acre. This gain in yield was accompanied by a distinct improvement in quality. The composition of Pennsylvania Broadleaf tobacco as modified by fertilizer treatment has been discussed elsewhere (E. S. R., 59, p. 831).

In tests of the relative value of fertility treatments in the development of permanent Kentucky bluegrass pasture on Volusia soil, compared with unfertilized land lime has reduced the proportion of weeds from 92 down to 23 per cent, lime with superphosphate (acid phosphate) from 70 to 16 per cent, and lime with manure from 74 to 12 per cent. Complete fertilizers and the reinforced manure treatment with lime produced pasture practically weed free and containing 93 per cent of pasture grasses and legumes.

The leading varieties of oats and barley are indicated, with comments on the relative winter hardiness of domestic and foreign strains of red clover (E. S. R., 55, p. 32) and on the characteristics of Patterson and Keystone oats, selected by the station.

Cover crops and green manures, B. BUNTING and J. N. MILSUM (*Malayan Agr. Jour., 16 (1928), No. 7, pp. 256–280, pls. 12*).—A number of plants are described, with notes on their value alone and in mixtures for cover crops and green manures.

Comparative winterhardiness of species and varieties of vetches and peas in relation to their yielding ability, K. H. KLAGES (*Jour. Amer. Soc. Agron., 20 (1928), No. 9, pp. 982–987*).—Plat tests at the Oklahoma Experiment Station with 20 sorts of vetches and peas showed that only two species of vetch, hairy (*Vicia villosa*) and woolly-podded (*V. dasycarpa*), and one variety of peas, the Austrian field pea (*Pisum sativum*), survived winter conditions without showing perceptible winterkilling. Hungarian vetch (*V. pannonica*) possessed a fair degree of winter hardiness, killing 4 per cent in the mild winter of 1926–27 and 14 per cent in the rather severe winter of 1927–28. The hay yields of the crops were in direct relationship to their winter survival.

Equality of kernel row numbers in reciprocal corn crosses, F. D. RICHEY and H. S. GARRISON (*Jour. Amer. Soc. Agron., 20 (1928), No. 10, pp. 1069–1072*).—Comparative tests between reciprocal crosses of selfed lines from strains mass selected for different numbers of kernel rows revealed no evidence of systematic inequality between reciprocals as to numbers of kernel rows such as was noted in the crosses of the parent strains (E. S. R., 53, p. 830). The yield differences were not deemed significant.

A possible relationship between soil salinity and stand in cotton, J. A HARRIS (*Jour. Agr. Research [U. S.], 37 (1928), No. 4, pp. 213–231, figs. 3*).—Studies with upland and Egyptian cotton at Sacaton, Ariz., wherein soil salinity was measured by the electrical resistance of the saturated soil mass in the standard soil bridge cup gave indications that under the range of soil salinities and other conditions of the experiment better stands are produced on more saline soils. These relationships should not be expected to hold if cotton were planted on soil of indefinitely higher salt content.

Effect of fertilizers on the size of cotton bolls, R. P. BARTHOLOMEW and G. JANSSEN (*Jour. Amer. Soc. Agron., 20 (1928), No 10, pp. 1048–1054*).—Fertilizer experiments by the Arkansas Experiment Station with several cotton varieties in different sections of the State demonstrated that fertilizers may increase cotton yields (1) by increasing the number of bolls per acre, (2) by increasing the number and size of bolls, and (3) by increasing the size of bolls and the percentage of lint per boll.

Location of "motes" in the upland cotton lock, H. E. REA (*Jour. Amer. Soc. Agron., 20 (1928), No. 10, pp. 1064–1068, fig. 1*).—A study of the locks of Anton cotton in 1924 and Benton cotton in 1925 and 1926 by the Texas Experiment Station showed a progressive increase in motes (aborted ovules) from the apex to the base of the lock, the percentage range being from 6.5 to 25.3 for the 9-seeded locks of Anton, 11.1 to 38.5 for the 11-seeded locks of 1925 Belton, and 17.2 to 83.3 for the 11-seeded locks of 1926 Belton. Five-locked bolls averaged 19.2 per cent of motes in Belton in 1925 and 4-locked bolls 16.8 per cent, while in 1926 the respective percentages were 27.5 and 20.5. The differences are suggested as nutritional or possibly due to incomplete fertilization.

Composition and economic possibilities of the cotton bur, K. S. MARKLEY (*Jour. Amer. Soc. Agron., 20 (1928), No. 10, pp. 1097–1101*).—Analyses at the U. S. Bureau of Standards of cotton burs produced in Oklahoma in the harvesting of cotton by snapping or sledding showed that without hydrolytic treatment they do not have a high feeding value for cattle, and they are not worth much as a source of furfural. While the pentosan content is quite low, their cellulose content might possibly make them valuable as a source of pulp for paper or rayon. The large quantities of mineral nutrients removed from the soil, evident from the ash analysis, should be replaced either by fertilizer application or by returning the burs to the soil either in the form of ash, whole burs, or preferably by the artificially decomposed burs.

Daily growth and oil content of flaxseeds, A. C. DILLMAN (*Jour. Agr. Research [U. S.], 37 (1928), No. 6, pp. 357–377, figs. 12*).—The daily growth of the seed of Rio flax was studied from flowering to maturity at St. Paul, Minn., in 1926, and the time of oil formation in the developing seed was determined at St. Paul and at Mandan, N. Dak., in 1926 and 1927.

The growth of flaxseed was found comparatively rapid. The seed increased proportionately in length, width, and thickness during the same period, reaching at from 12 to 14 days after flowering a maximum volume remaining more or less constant until the thirty-first day, after which a slight decrease occurred during ripening. The net weight of 100 seeds rose with increase in volume, reaching nearly its maximum at 13 days, but decreased rapidly after the thirty-fifth day during ripening. Seed growth continued uniformly for 33 days, whereafter the weight was constant to maturity at 39 or 40 days, indicating that no loss in total yield of seed would occur if the crop were harvested somewhat green, i. e., before the bolls and stems were fully brown.

The most rapid formation of oil, based on the oil percentage in dry seed, began at about the seventh day after flowering and continued for from 15 to 18 days. After the maximum percentage was reached little or no significant change took place up to full maturity. The total oil content of the seeds continued to increase with the increase in dry weight, the maximum oil content being coincident with the maximum dry weight. This point appeared to be from 6 to 9 days before the seeds were fully ripe and dry enough for harvest. The data indicated that flax may be harvested before the plant is ripe and dry without sacrifice in weight of seed per acre or in percentage yield of oil, permitting the production of better fiber flax and seed flax straw.

Drought at Mandan in 1926 dwarfed the vegetative growth, caused about two-thirds of the flowers to blight without setting bolls, reduced the number of seeds per boll, and apparently hastened the time of oil deposition and of maturity as compared with normal moisture conditions.

The brown color of the seed coat did not appear in the freshly gathered seed until the seed was nearly mature or about the time of maximum dry weight, about the thirty-sixth day after flowering at St. Paul in 1926. The coloring substance, some sort of tannin, evidently is present in the seed coat at an earlier stage.

Tests of seed grown at Mandan in 1927 showed no germination in seeds harvested less than 15 days after blooming, 38 per cent at 15 days, 80 at 18 days, 90 at 24 days, and an average of 95 per cent in samples taken from 27 to 36 days after blooming. The development of seeds from early and later flowers is discussed briefly.

A biometrical study of factors affecting yield in oats, F. R. Immer and F. J. Stevenson (*Jour. Amer. Soc. Agron., 20 (1928), No. 10, pp. 1108–1119*).—The characters associated with the yield of oats were studied biometrically at the Minnesota Experiment Station and at the Waseca, Crookston, and Morris Substations in 1927.

While plumpness of grain, date of heading, crown rust, and lodging were found to be closely related to yield, plant height and blast or spikelet blight had very little influence thereon. It seemed that the true relationship between yield and crown rust or yield and date of heading was masked in the total correlation coefficient and could be determined only when a partial correlation study was made. The yields of the same strains of oats grown at the station, Waseca, and Crookston were highly correlated, although these same strains did not respond in the same uniform manner at Morris as at the station or Crookston.

The Fulghum oat in California, T. R. Stanton and V. H. Florell (*Calif. Cult., 71 (1928), No. 16, pp. 381, 403, fig. 1*).—Agronomic data in experiments in cooperation with the California Experiment Station indicate Fulghum to be a promising new oats for California.

Proceedings of the fourteenth annual meeting of The Potato Association of America (*Potato Assoc. Amer. Proc., 14 (1927), pp. 255, figs. 32*).—The fourteenth annual meeting of the association, held in Nashville, Tenn., in December, 1927, is reported on, and the activities of the organization and of its committees in 1927 are summarized. Among the papers included, several of which are abstracted below, are Advantages of Growing Seed Potatoes on the Tuber Unit Basis, by E. D. Askegaard (pp. 7–11); Tuber Unit Planting, by F. M. Harrington (pp. 11–15); Some Improved Methods of Planting Seed Potatoes, by F. H. Bateman (pp. 16–19); Second and Concluding Test in

Maine of a Horse-Drawn Tuber-Unit Planting Machine, by D. Folsom and R. Bonde (pp. 19–26); Some of the Problems of Hill Selection of Potatoes, by J. R. Livermore (pp. 38–48); Strains of Seed Potatoes, by W. C. Edmundson (pp. 49–51); Field Tests in Sprouting Potatoes with Chemicals, by E. Alsobrook (pp. 65–68); Second Crop Irish Potatoes in the Southern States, by J. A. McClintock (pp. 68–71); Hollow Heart of Potatoes: Occurrence and Test of Thiourea Seed Treatments for Prevention, by H. O. Werner (pp. 71–88); Mosaic Control by Tuber Indexing Method as Applied to the Triumph Variety, by J. G. Milward (pp. 88–91); Some Certified Seed Surmises, by J. S. Gardner (pp. 91–94); A New and Destructive Disease of the Potato in Utah and Its Relation to the Potato Psylla, by B. L. Richards (pp. 94, 95); Transmission Studies of Virus Diseases of Potatoes in Michigan, 1926–27, by J. E. Kotila (pp. 95–101); The Value of Organic Mercury Compounds in the Control of Seed and Soil Borne Scab, by W. H. Martin (pp. 102–108); Seed Potato Treatments for Scab Control, by R. W. Goss and H. O. Werner (pp. 109–116); Seed Potato Treatments in 1927, by C. R. Orton and G. F. Miles (pp. 117–120); Bordeaux Sprays and Potato Hopperburn, by J. T. Quinn (pp. 120–122); Common Storage for Potatoes, by F. E. Fogle (pp. 137–143); Preparing the Virginia Potato Crop for Market, by G. S. Ralston (pp. 143–151); The Potato Grower's Marketing Problem, by D. D. Nichols (pp. 151–154); Relation of Standardization to Cooperative Marketing, by F. G. Robb (pp. 154–157); Cooperative Marketing, by A. W. McKay (pp. 157–162); Marketing Michigan's Potato Crop Cooperatively, by F. P. Hibst (pp. 162–167); Cooperation as Exemplified by the Farmers of the Eastern Shore of Virginia, by W. H. Taylor (pp. 167–170); Some Factors Influencing the Mid-Season Potato Market, by E. A. Stokdyk (pp. 170–199); A Summary of the Important Contributions to Potato Pathology Which Have Appeared in Foreign Periodical Literature in the Past Year, by F. Weiss (pp. 215–225); and A Review of Contributions to Potato Pathology Which Appeared in American Publications During the Year 1927, by J. E. Kotila (pp. 226–232).

Some instances of bud mutation in the potato, C. F. CLARK (*Potato Assoc Amer. Proc., 14 (1927), pp. 35–38*).—Mutations observed and described by the author included an addition to color in the tuber skin in the Peerless and Prolific potato varieties, a loss of skin color in Triumph and Improved Peachblow, a loss of eye color in Peachblow, and a loss of flower color in Triumph.

Potato fertilizer experiments, J. H. STALLINGS (*Soil Sci., 26 (1928), No. 5 pp. 351–362*).—Fertilizer experiments with potatoes at Penney Farms, Fla., showed 1 ton of complete fertilizer per acre to be more economical than 0.5, 1.5, or 2 tons. Potassium sulfate had no advantage over potassium chloride. The behavior of different nitrogen sources on two soil types suggested that the current practice of using for potatoes nitrogen from several sources, including expensive organics, may not be well founded. Top-dressings of ammonium sulfate and potassium sulfate resulted in increased yields.

A comparison of varieties in respect to physiological shrinkage in storage, C. O. APPLEMAN and C. L. SMITH (*Potato Assoc. Amer. Proc., 14 (1927), pp. 136, 137*).—Physiological studies at the Maryland Experiment Station with single potato varieties showed great variation in the rate of water loss due to changing internal conditions during different periods in their storage life. The high rate of shrinkage during the early weeks of storage declined rapidly to a very low rate during midstorage, even under dry conditions. The rate of water loss for several weeks at midstorage seemed to be determined entirely by external conditions. For several weeks of late storage there was a gradual deviation of the ratios from the constant of midstorage, indicating internal changes causing the tuber to transpire at a faster rate, this being especially true when sprouting began.

All of 16 varieties showed the same general trend of the single variety tests, although the actual rate of shrinkage in the different sorts varied greatly during early storage. By midstorage very little varietal difference was noted in respect to rate of water loss. With the beginning of the late storage period the varieties began to differ again, although certain groups showed similar behavior throughout the storage period.

The storage of potatoes immediately after harvest, R. C. WRIGHT and W. M. PEACOCK (*Potato Assoc. Amer. Proc., 14 (1927), pp. 122–125, figs. 4*).—Storage tests were made with 4 varieties of potatoes at 70, 60, 50, 40, 36, and 32° F. immediately after harvest, part of each lot being skinned in several places and periodically 10 tubers from each lot moved to 32° storage. Tubers held for 6 days in a preliminary storage temperature at 60 and 62 days at 32° showed no lenticel pitting and no killed eyes. The damaged areas were nearly healed over and showed slight low temperature injury. Those from 70° and the lower temperatures showed more or less injury. After 12 days of curing no injury was found in tubers from 70 to 60° preliminary storage, while after 17 days of curing no injury developed from 70, 60, and 50°. A definite tendency was observed in both skinned and normal potatoes of all sorts for the percentage loss in weight to increase as the storage temperature dropped.

The storage of cut seed potatoes, R. C. WRIGHT and W. M. PEACOCK (*Potato Assoc. Amer. Proc., 14 (1927), pp. 131–136, figs. 2*).—When potato seed of four varieties were cut and stored for 10 and 20 days at 50° F. with relative humidity near 95 per cent, the resulting percentage of germination, growth vigor, and yield equaled if not surpassed that from seed stock stored similarly but not cut until just before planting. Cut seed stored at 32° generally showed less vigor in growth and yield than that stored at 40 or 50°. This was also observed with seed stored at humidities of from 65 to 70 per cent in comparison with those from humidities near 95 per cent.

A practical conclusion drawn from the results is that seed potatoes may be cut safely as far as 21 days before planting with good results, provided the cut seed be stored under proper temperature and humidity. Ideal storage conditions for cut seed pieces apparently would be where the humidity is high enough to prevent evaporation, and where the temperature is low enough to prevent decay but not too low to prevent the ready suberization of the cut surfaces of the seed.

Influences of different storage temperatures on dormant seed potatoes, W. M. PEACOCK and R. C. WRIGHT (*Potato Assoc. Amer. Proc., 14 (1927), pp. 126–130, fig. 1*).—Trials involving four varieties of potatoes held at several storage temperatures before early and late plantings gave indications that the storage temperature on dormant seed potatoes from 2 or 3 weeks before planting affects the rapidity of germination, percentage of stand, vine growth, and yield. Tubers held at 40 and 50° F. for short periods before planting germinated better, and the plants from such tubers emerged through the soil surface from 5 to 12 days earlier than from tubers held at 32°. The potatoes held at the higher temperatures produced larger or more vigorous stalks, matured earlier, and gave correspondingly greater yields.

The production of seed potatoes in southwest Virginia for eastern Virginia farmers, M. S. KIPPS (*Potato Assoc. Amer. Proc., 14 (1927), pp. 52–56*).—Experiments by the Virginia and the Virginia Truck Experiment Stations showed that the better yields of potatoes were made at the higher altitudes, which also produced seed giving the better results in eastern Virginia. Plantings made about May in southwestern Virginia produced the highest potato yields and also furnished seed comparing favorably with seed from Prince Edward Island when grown in eastern Virginia. Storage tests are described briefly.

Old vs. fresh cut potato sets, P. M. Lombard (*Potato Assoc. Amer. Proc., 14 (1927), pp. 57–65, figs. 3*).—In studies at Presque Isle, Me., during 4 years Irish Cobbler potato seed cut 7 days before planting outyielded both fresh-cut seed and older-cut seed up to 47 days, and comparable results were obtained with Green Mountain seed. Any seed cut from 7 to 27 days before planting made greater yields than fresh-cut seed. The author points out that potato sets to keep for some time before planting should be suberized over thoroughly before storage unless storage conditions are such that suberization will proceed therein.

Some factors in preventing decay of potato sets, J. T. Rosa (*Potato Assoc. Amer. Proc., 14 (1927), pp. 26–35, figs. 2*).—Investigations at the University of California were concerned with the prevention of loss of stand in potatoes planted during hot weather.

When the tubers were cut some days before planting and the cut surfaces allowed to become suberized, more decay resulted than in plantings just after cutting. The percentage of sets decaying increased as the storage temperature for the cut sets rose from 35 to 72° F. Cut sets from small tubers were found less subject to decay than sets from large tubers, best results being had with sets from 2-oz. tubers halved transversely.

Chemical treatments for the curtailing of dormancy resulted in a better stand and more rapid sprouting of small whole tubers, although the gain in speed of sprouting was markedly less than from similar treatments with cutting of the tubers before planting. Dormant small tubers stored for 3 weeks at 86° sprouted faster than when stored at 72°. At both temperatures storage in moist sawdust resulted in more rapid sprouting after planting than dry storage.

Winter rye for western Canada, W. J. Mather (*Sci. Agr., 9 (1928), No. 3, pp. 154–172, figs. 4*).—Self-fertile lines selected from Dakold rye at the University of Saskatchewan averaged as high in viability and winter hardiness as did check material. The better cultural and spacing conditions of the nursery were more favorable to seed setting than under crowded field conditions. Lines were found showing a high degree of uniformity for high fertility and others for low fertility, and the material could be grouped as homozygous for high or low fertility and as heterozygous in this respect. High fertility seemed to be dominant, and differences in fertility appeared to be reflected in yield differences. Green and yellow kernels were heavier than brown kernels. Observations on winter wheat varieties suggested that winterkilling is largely due to lack of snow covering. A method for testing winter hardiness in the field is suggested.

Some factors which affect the inoculation of soybeans, H. J. Harper and H. F. Murphy (*Jour. Amer. Soc. Agron., 20 (1928), No. 9, pp. 959–974*).—Inoculation experiments with soy beans by the Oklahoma Agricultural College were made under a wide range of conditions in regard to locality, soil type, varieties, cultures, and methods to determine the main factors deterring satisfactory inoculation, particularly under Oklahoma conditions.

Maintaining a high moisture content in soil after a low moisture content for 10 days after soy beans were planted resulted in a lower percentage of inoculated plants and fewer nodules per plant in 9 of 13 varieties of soy beans studied. It seemed possible that a low soil moisture content at time of planting may be an important factor in reducing nodule formation. A milk suspension of soy bean bacteria added to the seed did not produce better inoculation than a water suspension, nor did the addition of superphosphate (acid phosphate) and potassium chloride to the test soil affect nodule formation. Keeping the soil at an optimum moisture content with chlorinated tap water instead of distilled water depressed nodule formation nearly 50 per cent, although not completely preventing inoculation.

Both field and greenhouse studies on many soy bean varieties, using both pure and mixed cultures, indicated that varieties differ considerably in their ability to resist infection by a particular strain of soy bean bacteria. A considerable difference was also observed in the ability of the different cultures to produce nodules.

Using the nitrogen content of plants as a measure of the beneficial effects derived from symbiosis, data presented show that under certain conditions uninoculated plants may contain a higher percentage of total nitrogen than inoculated plants. This indicates that some soy bean bacteria may be worth less than others in regard to the fixation of nitrogen and its subsequent utilization by the soy bean plant. Well inoculated soy bean plants on soil treated with 2 tons of wheat straw per acre contained less nitrogen than inoculated plants grown on untreated soil.

Effects of fertilizer treatment on the formation of nodules on the soybean, G. E. Helz and A. L. Whiting (*Jour. Amer. Soc. Agron., 20 (1928), No. 9, pp. 975–981*).—In studies at the Wisconsin Experiment Station the nodule organisms on soy bean seed were killed by applications of 200 and 400 lbs. per acre of potassium chloride in soil of 10, 25, and 40 per cent moisture content when the seed was placed in contact with the salt, whereas soy bean bacteria were not injured in solutions equivalent to those obtained by the total dispersement of such applications of potassium chloride or ammonium sulfate in the moisture of a soil containing 10, 25, or 40 per cent of water. Monocalcium phosphate in a similar test killed the bacteria in the higher concentrations, probably due to its acid nature. Normal nodulation of soy beans occurred in unfertilized soils containing 25 and 40 per cent of moisture, while at 10 per cent poor nodulation resulted. Normal nodulation was obtained in solution cultures with various nutrient salts in every case in which the plant growth was not held back by the fertilizer.

Phosphorus and potassium salts increased nodulation in field trials when used in quantities not inhibiting germination. Application of fertilizer in quantities large enough to lower the percentage of germination also decreased nodulation. Ammonium or nitrate salts in the quantities used decreased nodule formation, whereas cyanamide in 150-lb. per acre applications of a 2–12–12 fertilizer increased nodulation and a 300-lb. application decreased nodule formation. Dicyanodiamide formed by the polymerization of cyanamide seemed less toxic to the nodule organism than to the soy bean plant.

Reduction of soil nitrates during the growth of soybeans, E. P. Deatrick (*Jour. Amer. Soc. Agron., 20 (1928), No. 9, pp. 947–958*).—Many reports of reduced wheat yields after soy beans led to a study at the West Virginia Experiment Station of the nitrate content of soil growing soy beans under controlled conditions. Wheat was seeded just after soy bean harvest and 8 weeks after, in pots of Dekalb silt loam variously fertilized after soy bean tops were removed or turned under and on fallow.

The studies showed that the nitrates under maturing soy beans are very low, being considerably less at the time of harvest than the nitrates in fallow soil kept air-dry. Drainage water from both the soy beans and fallow soil did not affect the relative growth of a vigorous denitrifying fungus (*Fusarium semitectum*).

Indications were that when the soy bean harvest is so late that the time until the wheat planting is too short for considerable nitrification the nitrate supply is apparently too low, possibly largely due to absorption by the plant, to produce a yield increase above normal. Where winter wheat will follow soy beans in rotation soy beans of shorter growing periods should probably be planted to permit longer intervals for nitrification in the soil before wheat seeding. The pot tests indicated that a long period for nitrification is more beneficial than top-dressings of 200 lbs. of sodium nitrate or 8 tons of manure per acre, whether the soy bean tops are removed or not.

Sugar cane seedlings, J. A. Verret (*Assoc. Hawaii. Sugar Technol. Rpts., 7 (1928), pp. 15–23, fig. 1*).—Storage and germination studies with sugar cane seed suggested air-drying the tassel promptly and stripping the fuzz when crisp dry and easily shattered and placing it in cans. After displacing the air with carbon dioxide, calcium chloride at the rate of 9 gm. per 1,000 cc. of space should be distributed in small cans throughout the fuzz mass in the large can. After a second introduction of carbon dioxide the cans are sealed air-tight with wax or paraffin and stored at once at 31° F. It is essential that the drying and canning operation take place promptly.

Covering the fuzz in germination flats with a thin dressing of sifted volcanic ash was of distinct benefit. A cover of black sand increased germination and lowered subsequent mortality.

Hybridization methods are outlined and comment made on the use of the refractometer in making field selections.

Experience with P. O. J. 2725 sugar cane [trans. title], C. E Chardon (*Porto Rico Dept. Agr. and Labor Sta. Bul. 34 (1928), Spanish ed., pp. 67, pl. 1, figs. 9; Eng. abs., pp. 65–67*).—Imported into Porto Rico in 1923 from Argentina by the Federal Experiment Station, P. O. J. 2725 sugar cane exhibited high resistance to mosaic. Observations on considerable areas at several centrals showed that the cane bloomed early and profusely, with an accompanying progressive loss in weight. · Suggestions are made that P. O. J. 2725 be planted as main plant crop and never as spring planting and that it be cut early, i. e., in December or January, to permit the ratoons to develop a good crop. P. O. J. 2725 has given higher main crop yields of cane and sugar per acre than B. H. 10(12), S. C. 12/4, and P. O. J. 36, and has shown promise in ratoon plantings. Confirming results in Argentina (E. S. R., 57, p. 632) P. O. J. 2725 resisted deterioration very strikingly, retaining 98.1 per cent of its sucrose 13 days after cutting, 98.9 after 22 days, and 88.3 per cent after 28 days as compared with 90.7, 65.3, and 40.2 per cent. respectively, for B. H. 10(12) under similar conditions.

The distribution of sugar cane roots in the soil on the Island of Luzon, H. A. Lee and G. H. Bissinger (*Sugar News, 9 (1928), No. 8, pp. 527–536, figs. 2*).—A study of Pampanga Red sugar cane, reported in both English and Spanish, showed a much larger proportion of the roots in the upper 8 in. of soil (71.2 to 78.3 per cent) than in lower levels. Unfertilized cane had considerably greater root masses than cane treated with complete fertilizer or ammonium sulfate, while the treated cane had increased weights of stalk and tops. The bulk of the cane roots were also found in the upper 8 in. of soil with Luzon White first ratoons hilled up. The results showed that for accuracy comparisons of root systems must be made from equal numbers of stools in equal volumes of soil. The necessity of keeping fertilizer applications near the soil surface was demonstrated. The studies also indicated that the water table should at least be kept 24 in. from the soil surface and aeration encouraged to a depth of at least 4 in.

Root studies in soil drained by tile at the Ewa Plantation Co., W. P. ALEXANDER (*Assoc. Hawaii. Sugar Technol. Rpts., 7 (1928), pp. 90–92, fig. 1*).—Root studies by excavation after the harvest of a crop of H. 109 in a very heavy adobe clay confirmed the observation that poor drainage had prevented root expansion. However, the percentage of roots found in the strata from 24 to 40 in. deep over the tile drain system was comparable to that often obtained in a sandy loam. The large root growth was correlated with better yield.

Progress report on the effect of fertilizer on root distribution, W. WOLTERS (*Assoc. Hawaii. Sugar Technol. Rpts., 7 (1928), pp. 80–89*).—Observations on H.109 sugar cane roots on clay loam underlain by a more compact clay subsoil at several ages at depths of 0–8, 8–16, 16–24, 24–32, and 32–40 in. and fertilized in the combinations NPK, NP, NK, and N showed that on the average phosphorus was most effective in the middle strata, while potassium did best in the topmost strata for the first few months and in the lower depths at later periods. While nitrogen alone gave the poorest results, in combination with either potassium or phosphorous or both it had varying effects at different intervals, depending upon the combination. Data are also given on the aerial portion of the plant at the different periods. Nitrogen evidently must be supplemented by potassium and phosphorus for the development of a normal healthy plant for larger yields. A fairly uniform ratio existed between the root system and the aerial portion, the latter ranging from 81.9 to 88.8 per cent at 6.5 weeks to from 96 to 96.6 per cent at 12 months.

Some effects of sub-soil fertilization on the tops and root system of H–109 cane, D. M. WELLER (*Assoc. Hawaii. Sugar Technol. Rpts., 7 (1928), pp. 93–105, figs. 7*).—H. 109 cane plants receiving nitrogen, phosphorus, and potassium separately at the rate of 500 lbs. per acre to the third 8-in. (16 to 24 in.) layer of soil in root study boxes increased in linear growth over the controls 63.2, 68.3, and 93.7 per cent, respectively, and by dry weight of tops 78.4, 111.1, and 111 per cent, while by dry weight the total root mass of these plants was increased 61.6, 90.5, and 84.6 per cent, respectively. The percentages of total dried roots in the various soil levels were remarkably uniform for both control plants and for those receiving the application of fertilizers. No significant difference was observed between the proportion of roots on the same side of the box as the fertilizer and on the opposite side. Fertilizer applied to one part of the root system resulted in a stimulation of the entire root system as well as in a local stimulation. The increase in total root mass of the fertilized plants was in the shoot roots. The treated plants showed an increase over the control plants of actual weight and a decrease of actual total weight of the seed piece roots and an increase of actual total weight of shoot roots. The fertilizers decreased the weights of the original seed pieces. The ratio of tops to root was 1.9:1 for the controls, 2.1:1 for the plants receiving nitrogen, 2.1:1 for those with phosphorus, and 2.2:1 for those receiving potassium. There was no evidence that the roots showed any chemotropism to fertilizers.

The influence of the moisture content of the soil on the texture and weight of wheat grains, M. CHIRITESCU-ARVA (*Sci. Agr., 9 (1928), No. 3, pp. 178–180, figs. 2*).—Experiments at the Agricultural Academy at Cluj, Rumania, demonstrated that the physical properties of wheat grains vary greatly with differences in cultural conditions, although such variation occurs within the variety limits. With the same variety of Banat wheat under uniform growth conditions, when the vegetation space factor became smaller through an increase in the quantity of seed per unit area the weight per unit volume of the grains was increased and the weight per 1,000 kernels was diminished. In the Ulca (*Triticum vulgare lutescens*) and Arnaut (*T. durum hordeiforme*) varieties of spring wheat the grain texture and the weight per 1,000 kernels varied as a function of the moisture content of the soil. The hardness of the kernels of Arnaut wheat varied very slightly up to a certain limit with the moisture content of the soil, whereas grain hardness with Ulca wheat showed the reverse tendency. In Ulca wheat the degree of hardness of kernel varied according to length of time water was withheld during plant growth, the vitreous texture being especially pronounced with drought in the final growth stage, i. e., from blooming to filling.

The prevalence of mixtures in Marquis wheat grown in central Montana in 1926, K. S. QUISENBERRY, J. A. CLARK, and B. B. BAYLES (*Jour. Amer. Soc. Agron., 20 (1928), No. 10, pp. 1055–1063*).—Examination of samples of Marquis wheat from 102 fields in central Montana showed that 79, or 77.5 per cent, contained white kernels, and red-kerneled mixtures were also observed. Ten standard varieties were identified among the progeny of the white kernels and 9 among the progeny of the red kernels. White-kerneled strains resembling Marquis seem to have arisen from crosses between Marquis and some of the white-kerneled mixtures present.

Canadian wheat of excellent quality (*Northwest. Miller and Amer. Baker, 5 (1928), No. 10, p. 327, fig. 1*).—Tests reported by F. J. Birchard and T. R. Aitken from the Dominion grain research laboratory indicated that the milling and baking quality of Canadian wheat of the 1928 crop was distinctly superior to that of 1927. Compared to 1927, the moisture content was low, the weight per bushel and protein content higher, the absorption of flour slightly less, and the baking quality of the flour from each grade decidedly superior. The high milling and baking quality seemed due to the considerable percentage of hard plump sound wheat in all lower grades, delay in frost damage until the wheat was nearly ripe, and favorable harvest conditions.

The wild beet in California, E. CARSNER (*Facts About Sugar, 23 (1928), No. 47, pp. 1120, 1121, fig. 1*).—The wild beet, thought to be *Beta maritima* introduced from Europe, and hybrids between this species and cultivated beets, particularly sugar beets, is described as a weed occurring in Imperial, Santa Clara, Ventura, San Bernardino, Los Angeles, and Orange Counties in California. Besides the usual characteristics of a weed, the wild beet has been observed to carry leaf spot fungus (*Cercospora beticola*) and beet rust (*Puccinia subnitens*), and the possibility of harboring sugar beet nematodes is suggested. Since the wild beet is annual, it can be eliminated by removing the plants before seed formation.

The emulsification of Diesel oil for the control of puncture vine, E. JOHNSON (*Calif. Dept. Agr. Mo. Bul., 16 (1927), No. 1, pp. 15–19, fig. 1*).—In a discussion of preparation methods the author points out that emulsions of oil and water may have either liquid in the external phase, according to the emulsifier used. Emulsions with oil in the external phase are preferred for puncture vine control, being more readily absorbed into the burs. Caustic soda is the emulsifier commonly used for making an emulsion of Diesel oil and water with the oil as external phase. Little difficulty is had with a 50 per cent emulsion, regardless of the order in which the ingredients are added, but in making an emulsion of 25 per cent oil and 75 per cent water it is sometimes difficult to prevent the emulsion from thickening. Some factors influencing the consistency of the emulsion are the chemical composition of the oil, the water, and the emulsifier, and the speed of the agitator.

Eradicating quack grass with sodium chlorate, A. A. HANSEN (*Jour. Amer. Soc. Agron., 20 (1928), No. 10, pp. 1120–1123*).—Tests by the Indiana Experiment

Station demonstrated that patches of quack grass can be eradicated by mowing and saturating a month later with sodium chlorate used at the rate of 1 lb. per gallon of water. Best results are had when the grass is mowed and the sprouts saturated when from 6 to 10 in. high. At least two applications are usually needed for complete eradication under farm conditions and sometimes more where the work has not been done carefully. Sodium chlorate is said to be more effective than sodium arsenite, inexpensive, and nonpoisonous to man, farm animals, or soil.

HORTICULTURE

[Horticultural investigations at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 230 (1928), pp. 5, 30–33, 34, 35, figs. 3*).—As in the preceding report (E. S. R., 58, p. 334), W. Thomas discusses the results of studies upon the nutrition of the apple tree. Following the course of absorption of nitrates throughout an entire vegetative period in trees treated with nitrate of soda, Thomas found nitrates in the roots at all times during the growing season but never in the above-ground parts, leading to the conclusion that the synthesis of nitrogen compounds does occur in the roots of the apple. Determinations of the composition of Stayman Winesap trees grown in iron cylinders and submitted to differential fertilizer treatments showed a much lower carbohydrate : nitrogen ratio in the nitrated trees than in those receiving no fertilizer or phosphorus or phosphorus plus potash. Apparently the nonnitrogen trees had insufficient nitrogen to utilize the stored carbohydrates. Potash in its second annual application had a decided effect in increasing the absorption of both nitrogen and phosphorus, resulting in an increased utilization of stored carbohydrates. The assimilation and utilization of phosphorus even though applied in an available form was very low, except where there was an abundant supply of available nitrogen in the soil. Nitrogen and phosphorus in the order given were the limiting factors. The poor development of the nonnitrogen trees is ascribed to a lack of physiological balance rather than to a failure to assimilate carbohydrates.

As established by C. E. Myers, selected strains of Early Jersey Wakefield cabbage were superior to commercial strains in earliness of maturity, head size, total yield, and uniformity. Commercial strains of Copenhagen Market cabbage were materially superior to a selection made in 1924. Considerable variation was observed in substrains of the Penn State Ballhead cabbage in respect to resistance to blackleg disease. The Penn State Earliana tomato proved superior in uniformity and yield to other early varieties, and Matchum with one exception was better than late varieties. Genetic analysis of second-generation plants of a cross between Golden Dwarf Champion and Burbank Preserving tomatoes showed epidermis and endocarp color to be transmitted according to Mendelian expectations. In another progeny epidermis color did not segregate nor did endocarp color follow the expected ratio.

Lettuce breeding conducted by M. T. Lewis showed the most desirable commercial segregates in the F_2 generation of a Golden Yellow Stonehead×Early Butternut cross. Pure line selection with Green Leaved Big Boston and Wayahead gave favorable results, but progress with the New York variety was impeded by failure to set seed. Tom Thumb and New York in various crosses did not prove valuable parents. Observations on Big Boston and New York lettuces on muck showed the latter to be unadapted to such soil, and Big Boston produced heavier heads on clay than on muck.

J. E. Knott found that pruning or pinching of tomato plants delayed the ripening of the fruit. Comparing open crates with sand covered, Knott found that in 3 months carrots lost 20 and 10 per cent weight, respectively, but that the open crate carrots were more attractive. There was but little difference in the weight of parsnips, and beets lost slightly less weight under sand. Studies by Knott and Anthony (E. S. R., 60, p. 43) upon the catalase growth relationship of horticultural plants showed a greater activity in fruit than in vegetable buds, with greater differences in autumn than in early spring.

W. B. Mack again reports that fertilizers, except in the case of heavy manure applications, had no influence on the canning quality of tomatoes (E. S. R., 59, p. 439). Determinations of colloidal matter and moisture showed no measurable relationships. Studies by Mack on the effects of ethylene on the blanching and respiration of celery showed a gradual increase in respiration beginning 24 hours after the initiation of the treatment and continuing until blanching was quite evident. Blanching began first in the older leaves.

The importance of maintaining the organic content of orchard soils was determined by Anthony in various localities. Organic material may be supplied in the fall by heavy growth of grass, cover crops, or manure. Nitrogen applications in the sod orchard not only counteracted nitrogen depression but also stimulated grass growth which in turn added fertility. Some indication was noted that despite added nitrogen long continuance of heavy bluegrass sod diminished the vigor of trees. Data obtained by Anthony on the Stayman Winesap trees which comprised the cylinder experiment confirmed observations in the field, namely, that nitrogen, phosphorus, and potash in the order given are necessary for apple production in the Hagerstown loam type of soil. The return from potash was so slight as to be practically negligible. Observations showed marked differences in the response of apple varieties to identical storage conditions; for example, Baldwin shriveled in a situation that proved satisfactory to Stayman Winesap.

Fruit bud initiation in the strawberry was found by R. H. Sudds to be hastened by the subjection of the plants to an 8-hour day. Attached runners subjected to total darkness after July 15 showed earlier initiation than did normal plants. F. N. Fagan and Sudds found that ringing performed a week before blossoming had no effect whatsoever on the amount or viability of Winesap or Rhode Island apple pollen.

Radium activity in horticulture [trans. title], J. Stoklasa (*Gartenbauwissenschaft, 1 (1928), No. 2, pp. 141–153, figs. 6*).—Studies at the Experiment Station for Plant Production, Prague, showed that photosynthesis in the chlorophyll-containing cells was greatly stimulated by exposure to the Beta and the Gamma rays. Cucumber plants whose leaves were treated from the beginning yielded 1,243 gm. as compared with 689 gm. for the control plants. Treated mint and tobacco plants weighed 527 and 684 gm., respectively, as compared with 396 and 316 gm. for the untreated plants.

Muck-soil reaction as related to the growth of certain leaf vegetables, E. V. Hardenburg (*Plant Physiol., 3 (1928), No. 2, pp. 199–210, figs. 2*).—Studies with lettuce, mustard, endive, and parsley grown in pot cultures on a highly fertilized low-lime muck soil having an initial pH value of 5 but modified with sulfur, aluminum sulfate, and calcium carbonate to provide a soil reaction ranging from pH 4 to 7 showed that parsley and endive respond more consistently to decreasing acidity than do either lettuce or mustard. No obvious correlation was noted between H-ion concentration and root and top ratio for lettuce, mustard, and parsley. In the case of endive, root development was favored by a culture medium which approached neutrality.

The water requirements of lettuce, mustard, and parsley increased rather sharply with each increment in calcium carbonate applied, and there was a corresponding but less marked decrease with endive. With all four vegetables the maximum water requirement was reached in the more acid cultures.

Changes in composition during ripening and storage of melons, J. T. Rosa (*Hilgardia [California Sta.], 3 (1928), No. 15, pp. 421–443, figs. 4*).—With a view to standardizing harvesting practices a study was made of the various chemical and physical changes incident to ripening. A progressive increase in the percentage of total solids, total sugar, insoluble solids, and in specific gravity of the juice was observed in fruits of the cantaloupe, the Honey Dew and Casaba melons, and the watermelon when ripened on the vine. Reducing sugars consisting of approximately equal proportions of levulose and dextrose decreased in amount during ripening, apparently being used in part in respiration and also converted into sucrose. Sucrose increased more rapidly than reducing sugars decreased, suggesting that sugars continue to move into the fruits during ripening. The amount of protopectin decreased rapidly during ripening, with a corresponding increase of pectin and probably of pectic acid. The proportion of pectic substances in soluble form increased during ripening, suggesting that partial disintegration of cell walls is an important part of the ripening process.

Fruits picked prior to full maturity and held at from 70 to 75° F. showed little or no increase in sugar content in the early part of the storage period and even a small decrease during the latter part due to respiration losses. Honey Dew and Casaba melons exhibited the same changes in form of sugars, i. e., a decrease in reducing and an increase in sucrose, as did fruits ripened on the vine. The total content of pectic substances decreased slightly, and protopectin was changed to pectin just as in fruit on the vine. Melons did not gain appreciably in sweetness after harvesting.

Casaba and Honey Dew melons softened more rapidly and took on a yellow rind color sooner when treated with ethylene but did not attain good eating quality unless commercially mature when picked. Ethylene apparently stimulated enzymatic reactions.

The finding of pectic acid in the water extract of cantaloupes but not in that of the Honey Dew or Casaba melons is associated with differences in enzymatic reactions. These differences are believed an important factor in the differential ripening of the two groups of melons. Both pectic acid and protopectin were found in the insoluble residue of all the four types of melons used in the study.

The influence of seed size in the radish [trans. title], W. Gleisberg (*Gartenbauwissenschaft, 1 (1928), No. 2, pp. 81–92, figs. 5*).—Studies at the University of Breslau with graded radish seeds showed that the larger seeds not only gave higher and stronger germination but also resulted in markedly larger plants. Comparing seeds 2.5–3 mm. in diameter with those below 2 mm., the average weights of the resulting plants were 307±4.7 and 109.7±1.96 gm., respectively. In the case of the smaller seeded lot the roots comprised 30.9 per cent of the total plant weight as compared with 39.2 per cent for the larger lot, indicating that large seed had a greater influence on root than on top growth.

The nutrition of the tomato [trans. title], F. Heydemann (*Gartenbauwissenschaft, 1 (1928), No. 2, pp. 100–140, figs. 2*).—Increases in the temperature of the air and soil, protection from storms, and increased light were found to increase the assimilating capacity of the tomato and thus promote earlier ripening and larger yields. The assimilation of nitrogen, calcium, potash, and phosphorus proceeded at an equal rate for a time, following which potash and nitrogen were used more rapidly. A shortage of carbon dioxide in the air was a limiting factor to growth and yield. Artificial increases of carbon dioxide stimulated yields as much as 27 per cent, and the resulting fruits had a lower water content, higher specific gravity, and more dry substances. The use of carbon dioxide in the greenhouses proved uniformly profitable. Plants regularly supplied with carbon dioxide showed a significantly higher utilization of soil nutrients, especially nitrogen, potash, and phosphoric acid.

The high water content of the tomato, from 94 to 96.8 per cent, requires an adequate soil moisture supply, especially during the period from fruit set to maturity. The nutrient requirements of the tomato varied according to the manner of culture used. A satisfactory lime supply in the soil was found desirable, and it is suggested that nitrogen and potash fertilizers should be applied previous to planting because both substances are used from the start.

Standardization of rootstocks [trans. title], J. A. M. SPRENGER (*Gartenbauwissenschaft, 1 (1928), No. 2, pp. 93–99*).—Commenting on the rootstock investigations at the East Malling Research Station, the author reports that comparable studies have been in progress at Wageningen, Netherlands, and have yielded practically the same results. Great confusion was noted in the nomenclature of fruit stocks, the same names being applied to altogether different types. The classification adopted by Hatton has been accepted in Holland. Various commercial varieties have been worked on the several rootstocks to determine their behavior. A key is presented to aid in the identification of the stocks. New types of rootstocks are believed to arise by vegetative mutations as well as from seedlings.

Further self- and cross-pollination experiments with the Baldwin apple, F. S. HOWLETT (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 105–110*).—The results of experiments at the Ohio Experiment Station in 1927 again (E. S. R., 57, p. 736) showed that the Baldwin apple is not sufficiently self-fertile to produce satisfactory crops when planted alone. Furthermore, in tests on McIntosh, Mother, Jonathan, and Rome, Baldwin pollen gave such poor results as to be rated an ineffective pollinizer. In the laboratory Baldwin pollen failed to germinate satisfactorily in cane sugar or agar media. No evidence was found that the type of protection employed or emasculation had any significant influence on results.

Studies in apple sterility, H. E. KNOWLTON (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 111–114*).—Records taken by the West Virginia Experiment Station in a series of pollination experiments showed Stayman Winesap and Black Twig to be commercially self-sterile. In one trial which proceeded under exceptionally favorable weather conditions Stayman Winesap set 5.7 per cent when selfed. Delicious, Grimes, Jonathan, and Ben Davis proved satisfactory pollinizers for Stayman Winesap. Delicious proved satisfactory for Black Twig and Delicious and Grimes for Golden Delicious, a variety which was apparently nearly self-sterile.

Apple breeding: The vigor of Antonovka seedlings, H. L. LANTZ and S. MERRILL (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 115–120, figs. 2*).—Records taken at the Iowa Experiment Station upon 1,177 apple seedlings representing 8 parental combinations in which Antonovka occurred either as ovule or pollen parent suggest that each apple variety is capable of transmitting a definite quota of vigor and quality of growth to its progeny. In two series of seedlings, Ashton×Antonovka yielded the most vigorous trees, suggesting that Ashton is a prepotent parent. In reciprocal crosses between Jonathan and Antonovka the seedlings with Jonathan as ovule parent were apparently the more vigorous.

Occurrence of burr-knot in cross-bred apple seedlings, S. MERRILL and T. J. MANEY (*Amer. Soc. Hort. Sci. Proc., 24 (1927), pp. 121–125*).—Further evidence (E. S. R., 56, p. 835) is presented to show that the condition known as burr-knot is of genetical rather than of pathological origin. Data obtained on 4,616 apple seedlings representing 181 parental combinations showed that the occurrence of burr-knot in seedling progenies is associated with certain parents. However, no parental variety was found to produce burr-knot seedlings invariably, it being apparent that burr-knot was frequently carried as a latent character. Burr-knot often appeared in progenies from apparently burr-knot free parents. Delicious, Northern Spy, Northwestern Greening, Anisim. Grimes, and possibly Antonovka carried factors for burr-knot.

Cultural tests of Russian fruits [trans. title], T. ZLCHOKKE (*Landw. Jahrb. Schweiz, 42* (*1928*), *No. 5, pp. 657–682*).—A report from the Swiss experiment station at Wädenswil upon the results of a test of 23 varieties of apples and pears introduced from Russia and planted in mountainous regions having an elevation of 900 meters (2,952 ft.).

The present status of the fruit storage problem [trans. title], H. KESSLER (*Landw. Jahrb. Schweiz, 42* (*1928*), *No. 5, pp. 598–642, figs. 6*).—A comprehensive review, based in considerable part upon work conducted in the United States, of investigations upon the physiological aspects and the technique of fruit storage and designed to serve as a groundwork for prospective Swiss investigations.

Hybrids of the Hautbois strawberry, G. F. WALDO and G. M. DARROW (*Jour. Heredity, 19* (*1928*), *No. 11, pp. 509, 510*).—The discovery of a few fertile seedlings in the progeny of crosses between a pistillate form of *Fragaria virginiana* and the cultivated varieties, Black Hautbois and Monstreuse Hautbois, belonging to *F. moschata* is believed to indicate the possibility that *F. moschata* may have entered into the development of the modern strawberry.

Strawberry growing in Michigan, R. E. LOREE (*Michigan Sta. Spec. Bul. 182* (*1928*), *pp. 29, figs. 9*).—General information is presented on the economics of strawberry production and upon culture, varieties, fertilizers, mulching, control of pests, etc.

Bulb growing in Alaska, C. C. GEORGESON (*Alaska Stas. Circ. 2* (*1928*), *pp. 11, figs. 6*).—Tests at the Sitka Station demonstrated that various bulbs—narcissus, tulip, English iris, gladiolus, and the Regal lily—may be grown and flowered successfully in Alaska. Information is offered on culture, varieties, methods of handling the bulbs, etc.

Irises, F. F. ROCKWELL (*New York: Macmillan Co., 1928, pp. X+84, figs. 18*).—Culture, propagation, species, varieties, and breeding are among the subjects considered in this small handbook.

Physiological researches on the fertility in Petunia violacea.—V, On the relation between the soil moisture and the fertility [trans. title], S. YASUDA (*Bot. Mag.* [*Tokyo*], *42* (*1928*), *No. 498, pp. 317–325, fig. 1; Eng. abs., pp. 324, 325*).—Marked differences were found in the self-fertility of nearly sterile petunia plants of the same clon when grown in dry soil and in moist soil. The plants in dry environment gave much better results than those grown in moist soil. Pollen from self-sterile or nearly self-sterile plants when placed in a cane sugar solution containing stigmatic fluid from flowers of plants grown under dry conditions germinated much more satisfactorily than when the stigmatic fluid was taken from plants grown in a moist situation. When pollen of self-fertile plants was examined the opposite results were indicated. Apparently when nearly self-sterile plants were cultivated under wet conditions the character of the stigmatic secretion became unfavorable to germination.

Rhododendrons and their kin, C. H. CONNORS (*New Jersey Stas. Circ. 210* (*1928*), *pp. 15, figs. 3*).—Information is presented on the characteristics and cultural requirements of various species and varieties of rhododendrons, azaleas, laurel, and related plants which may be grown in New Jersey. Among the points discussed are selection of site and soil, methods of culture, fertilization and pruning, and the protection from various enemies.

FORESTRY

[Forestry studies at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 230 (1928), pp. 28-30, fig. 1*).—A comparison by J. A. Ferguson after 20 years of service of six types of shingles, (1) chestnut, (2) chestnut creosoted, (3) loblolly pine creosoted, (4) pitch pine creosoted, (5) redwood, and (6) western red cedar, showed no appreciable differences in durability but striking differences in physical properties. The pitch pine shingles had warped and twisted excessively, rendering them useless. Loblolly pine, on the other hand, proved satisfactory. After 18 years redwood shingles showed a greater tendency toward warping than did western cedar shingles.

Spacing experiments begun in 1921 with white pine, red pine, and Norway spruce showed little differences in height growth between the various distances employed. Preliminary studies by A. C. McIntyre upon root distribution in the black locust showed most of the roots to be located in the upper surface soil layer. Some feeder roots were, however, traced down to a 5-ft. depth.

Trees for Washington farms: Why, where, what, when, and how to plant, E. H. Steffen and C. M. Genaux (*Washington Col. Sta. Pop. Bul. 145 (1928), pp. 47, figs. 17*).—Beginning with a general statement concerning forestry and climatic conditions, the authors present general information on the establishment of shelter belts, farm woodlots, and ornamental plantings, describing in detail the various available coniferous and broadleaf species and making suggestions on the selection of planting stock, time and methods of planting, etc.

The farm woods, W. R. Mattoon (*U. S. Dept. Agr. Leaflet 29 (1928), pp. 8, figs. 2*).—An appeal for the rational use of farm woods and woodlands.

Continuous forest production as a solution of American forest problems, A. B. Recknagel (*Sci. Mo., 27 (1928), No. 4, pp. 367-374, figs. 5*).—A plea for the rational use of the remaining virgin forests of the United States and for the building up of a sustained production equal to the needs.

The Douglas fir in Switzerland [trans. title], H. Badoux (*Mitt. Schweiz. Centralanst. Forstl. Versuchsw., 14 (1926), No. 1, pp. 3-27, pls. 3, figs. 12*).—Of the various exotic conifers grown in the forests of Europe the green Douglas fir is held in greatest favor on account of its remarkable rate of growth and quality of wood. In Switzerland Douglas fir was found to grow in height and volume more rapidly than Norway spruce. The characteristics of the wood were such as to place Douglas fir between Norway spruce on the one hand and larch on the other.

Some anatomical notes on the seedlings of Pinus densiflora and P. thunbergii [trans. title], A. Iizuka and K. Morikawa (*Bul. Sci. Fakult. Terkult., Kjuŝu Imp. Univ., Fukuoka, Japan, 3 (1928), No. 1, pp. 49-59, figs. 6; Eng. abs., pp. 58, 59*).—Difficulty in distinguishing between the seed and seedlings of *P. densiflora* and *P. thunbergii* led to a series of anatomical studies in search of characteristic features. The cross section of the cotyledon of *P. densiflora* was consistently of the form of a regular triangle with the apex of the ventral side acute, while the cross section of the cotyledon of *P. trunbergii* was always in the form of an isosceles triangle with the apex of the ventral side much more obtuse. The location of the resin canals in the true leaves was a distinctive character, those of *P. densiflora* lying close to the hypoderm, while those of *P. thunbergii* lay in the green tissue.

The root system of a longleaf pine, E. W. Gemmer (*Sci. Mo., 27 (1928), No. 4, p. 384, fig. 1*).—Observations in the Choctawhatchee National Forest, Florida, upon a longleaf pine 3 in. in diameter at breast height and 20 ft. tall showed the roots to occupy an elliptical area of 150 sq. ft. It was estimated that without the taproot the tree had contact with approximately 50 cu. yd. of soil.

Carbon dioxide nutrition of forest trees, T. Weinicke (*Die Kohlenstoffernährung des Waldes. Berlin: Julius Springer, 1927, pp. VII+176, figs. 22*).—The carbon dioxide output of the soil was found to vary markedly during the day, in some cases actually increasing 100 per cent above the minimum. There was also a seasonal variation increasing from April to July and then gradually declining. This variability led the author to suggest that in comparing two experimental areas it is necessary to make repeated determinations.

Heat and moisture were the principal factors influencing variability of carbon dioxide output. Excessive as well as too little moisture was a limiting factor. The amount of decaying organic matter in and upon the soil was also highly important.

Carbon dioxide concentration in the forest air was higher than in the open. The maximum reading was 0.081 and the minimum 0.02 per cent. Frequently the carbon dioxide content was lower at the ground surface than at 1.5 meters (5 ft.) elevation. From 1.5 meters to the crown of the trees the carbon dioxide content declined. Without exception there was recorded a sharp reduction in carbon dioxide in the crown itself in the zone of rapid assimilation. Since carbon dioxide content is higher below than above the tree crown, it is assumed that most of the carbon dioxide used by the tree is taken from the lower air.

No significant differences were noted between the carbon dioxide output and carbon dioxide concentration in broadleaf and coniferous stands. Mulching and cultivation both increased the carbon dioxide output. Wind in general reduced carbon dioxide concentration, while natural or artificial barriers increased the content. Therefore types of cutting which decrease the strength of the wind are suggested as a means of conserving carbon dioxide produced in the soil.

Commercial timber trees of the Malay Peninsula, F. W. Foxworthy *Malayan Forest Rec., No. 3 (1927), pp. [2]+195, pls. 138*).—A manual of identification, containing in addition to a key of the species information on nomenclature, distribution, and associated species, and notes on the habit of growth, bark, leaves, flowers and fruit, and forest products.

DISEASES OF PLANTS

Botany (*Pennsylvania Sta. Bul. 230 (1928), pp. 17, 18-20, fig. 1*).—Brief reports are given of some results of investigations conducted in this department, some of which are in continuation of the work of the previous year (E. S. R., 58, p. 339).

In additional treatments of casing soils with formaldehyde and carbon-disulfide emulsion, conducted by W. S. Beach for the control of *Mycogone perniciosa* on mushrooms, formaldehyde (1-25) is said to have given a high degree of control with moderate stimulation of mushroom production. Carbon-disulfide emulsion gave moderate control with greater stimulation of production. Experiments with a humidifier are said to have shown that houses with a humidity of about 85 per cent gave better results than when the humidity was higher. The growth of the mushroom spawn increased the acidity of the compost used, and with heavy production it may be reduced to pH 4.5 or slightly lower.

Experiments by H. W. Thurston, jr., E. H. Dusham, and F. N. Fagan in the summer of 1917 are said to have shown that the best results on the control of apple scab were secured with standard lime-sulfur spray and with an 80–10–10 sulfur dust. The percentages of scab-free fruits were almost identical for each treatment. Nine years' work, however, is said to have shown that good results with dust have been exceptional.

Studies by L. O. Overholts have revealed the presence of the white pine blister rust on both pines and currants in forests in Clarion County, Pa. Observations by the same investigator are said to show that the larch-willow rust is capable of continuous existence on the willow, and in the case of the basket willow the fungus may result in the death of the host plant.

Continued studies by E. L. Nixon have failed to reveal how infection takes place by fire blight (*Bacillus amylovorus*) on apple blossoms. The method of migration to the roots of the apple tree has been determined. A chance pear seedling immune to fire blight is reported to have been found. The behavior of the organism in immune tissues is being investigated.

Investigations on tobacco wildfire begun by Beach in the spring of 1928 have shown that remains of infected tobacco plants exposed to the weather during winter on old fields are able to cause severe cases of disease the next season when placed on beds of seedlings. In one instance, steaming a seed bed did not prevent the appearance of the disease. Tobacco seedlings were found to be very tolerant of applications of organic mercury compounds, and a considerable stimulation of growth is attributed to their use. Applications of solutions of organic mercury compounds to centers of wildfire infection in seed beds checked the normal spread of the disease and in some cases apparently destroyed the parasite. Formaldehyde treatment of seed-bed soil gave a marked improvement in the growth of tobacco seedlings. In a single experiment, formaldehyde treatment prevented the appearance of any disease where a considerable amount of infected trash had been placed.

Important soil-borne diseases of crops in western Canada, G. B. Sanford (*Sci. Agr., 7 (1927), No. 8, pp. 292–294*).—This paper particularly refers to foot and root rots of wheats and other grain crops, including take-all disease and those caused by *Helminthosporium sativum* and *Fusarium* spp.; the root rots of clover; common scab and Rhizoctonia (scab) of potato; and wilt of flax.

Plant diseases in Jamaica in 1927, F. E. V. Smith (*Jamaica Dept. Agr. Ann. Rpt. 1927. pp. 18, 19*).—In this report, covering the work of eight months only, the microbiologist deals briefly with banana Panama disease (*Fusarium cubense*), bonnygate disease (*Sphaerostilbe musarum*), and black spot (*Cercospora musarum*); sugar cane mosaic, root disease, and leaf spots; coconut bud rot, leaf die-back (*Diplodia* sp.), and a premature leaf yellowing (*Pestalozzia palmarum*, supposedly secondary); citrus root diseases and scab (*Sporotrichum citri*) and grapefruit thread blight (*Corticium koleroga* ?); coffee brown eyespot (*Cercospora coffeicola*); tomato leaf mold (*Cladosporium fulvum*); and mosaic on beans and solanaceous crops.

Control of fungus diseases, E. A. Walters (*West Indies Imp. Dept. Agr., St. Lucia Agr. Dept. Rpt. 1926, pp. 10, 11*).—Sugar cane gumming disease (*Bacterium vascularum*), the marked symptoms of which are described, is most evident in heavy land where cultivation is defective and root penetration difficult.

Cacao pod rots (Phytophthora and Diplodia) were favored by summer wet weather. Rosellinia root disease is reported as extending. Lime withertip

(*Gloeosporium limetticolum*) was detected in March, 1927. Spraying was ineffective and uneconomical. Banana Panama disease (*Fusarium cubense*) is, with a few exceptions, present in the older estates. Means indicated have reduced its rate of spread.

Reports from the mycological department, E. S. SALMON and W. M. WARE (*Jour. Southeast. Agr. Col., Wye, Kent, No. 24 (1927), pp. 149–154*).—These reports include immunity studies; wheat bunt control; apple and pear scab winter stages; incidence of apple scab on apple varieties in a mixed plantation; potato blight (*Phytophthora infestans*) and its perpetuation in the tuber; influence of grafting on the susceptibility or immunity of hop varieties to mold (*Sphaerotheca humuli*); control of cherry brown rot (*Monilia cinerea*); hop downy mildew (*Pseudoperonospora humuli*), mosaic, canker, leaf spot, and drop; plum blossom wilt; fungicides; spraying experiments against black spot or apple scab; and mosaic and leaf curl (virus) potato diseases.

The therapy of nursery disorders [trans. title], H. R. OPPENHEIMER (*Angew. Bot., 8 (1926), No. 3, pp. 137–146*).—This rather general presentation includes discussion of animal pests of plants as well as of fungus and bacterial diseases.

Smoke injury and its control [trans. title], F. WISSEMANN (*Mitt. Deut. Dendrol. Gesell., No. 38 (1927), pp. 252–254*).—The history is briefly and selectively reviewed of injury to vegetation due to combustion products, and even dust, since the year 1348.

Injury to onions and fruits caused by exposure to ammonia, G. B. RAMSEY and L. F. BUTLER (*Jour. Agr. Research* [*U. S.*], *37 (1928), No. 6, pp. 339–348, pl. 1*).—Studies are reported on the cause of certain brownish and greenish black discolorations of fruits and onions that have been held in storage. Discolored onions were most commonly found, but discolored apples, pears, peaches, and bananas were also observed. No causal organism could be recognized, and in the absence of such a cause storage conditions were investigated.

Laboratory experiments showed that the type of injury could be duplicated by the exposure of onions and fruits to ammonia (0.8 to 29.3 per cent) at 70° F. and relative humidities of 30 and 85 per cent. In cold storage at 31.5°, with from 0.8 to 3.2 per cent, ammonia and a relative humidity of 83 per cent caused injury. Variations in temperature did not greatly influence the rate or extent of discoloration.

In the case of the onion, yellow, brown, and red pigment-bearing tissues became brownish to dark brown and in some cases greenish black when exposed to ammonia. The injury may be merely a blemish, as in the discoloration of the outer dry color-bearing scales of the onion and the darkening of the lenticels of the apple and pear, or it may be serious, as in the softening and discoloring of onions and in the browning and softening of pears, bananas, and peaches.

The host plants of Fomes annosus, M. WILSON (*Brit. Mycol. Soc. Trans. 12 (1927), pt. 2–3, pp. 147–149*).—The 13 references here listed as referring to or supposedly concerned with *F. annosus* range over the period 1838–1924.

On species of the genus Nigrospora Zimmermann recorded on monocotyledons, E. W. MASON (*Brit. Mycol. Soc. Trans., 12 (1927), pt. 2–3, pp. 152–165, pl. 1*).—A brief account is given of studies related to the genus *Nigrospora*, more particularly as noted or reported to be present on banana, coconut, maize, rice, sugar cane, and other plants, with a list of species assigned to this genus ranging chronologically from 1873 to 1918.

It is said that a number of black-spored Hyphomycetes recorded as occurring on monocotyledonous hosts are referable to the genus Nigrospora (Basisporium). On the basis of spore measurements three species are provisionally accepted. "There is, at the moment, no evidence that the different strains can be classified by the host on which they occur or by their country or origin."

Studies on Rhizoctonia crocorum (Pers.) DC. and Helicobasidium purpureum (Tul.) Pat., W. BUDDIN and E. M. WAKEFIELD (*Brit. Mycol. Soc. Trans., 12 (1927), pt. 2-3, pp. 116-140, pls. 4*).—In this paper, read at the International Congress of Plant Sciences (E. S. R., 55, p. 101) as the outcome of observations and experiments made during three years with the object of elucidating the life history of *R. crocorum*, the results obtained are regarded as preliminary only.

Fertile *H. purpureum* has been found in close association with root rot characterized by infection cushions of *R. crocorum* in distinct localities on red clover, *Mercurialis perennis*, and *Urtica dioica*. In order to test the possible connection of the two fungi, they have been studied in culture and as to morphology and pathogenicity, and the results of these studies are outlined. The bearing of the observations is discussed. While it is admitted that inconsistencies in behavior appear, it is thought that these may be due to the fact that the organism is very variable and that the strains are not all equally parasitic. Practically nothing is yet known as to the conditions for infection with *R. crocorum*. The evidence is considered to favor the view that *H. purpureum* is the perfect stage of *R. crocorum*.

Macrophomina phaseoli (Maubl.) comb. nov., the pycnidial stage of Rhizoctonia bataticola (Taub.) Butl., S. F. ASHBY (*Brit. Mycol. Soc. Trans., 12 (1927), pt. 2-3, pp. 141-147, fig. 1*).—A brief account is given regarding contributions and, in general, accessible information concerning the fungus which has been referred (though it is here claimed erroneously) to *R. solani*.

"As *Macrophoma phaseoli* . . . is the earliest applicable binomial which the author has been able to recognize, the combination *Macrophomina phaseoli* (Maubl.) nov. comb. is proposed." Nine synonyms are given, corresponding to namings and descriptions ranging in time from 1905 to 1925.

Experiments on the physiology and genetics of the smut fungi, S. DICKINSON (*Roy. Soc. [London], Proc., Ser. B, 101 (1927), No. B 708, pp. 126-136, pl. 1, figs. 3; 102 (1927), No. B 715, pp. 174-176*).—An investigation is described in the first of these two papers dealing with the cytology of the covered smuts of oats and barley in pure culture and with the fusion, both within and across the species investigated, between the mycelia of different gender derived from single sporidial isolations. The fusion hypha is binucleate, and nothing suggests the occurrence of nuclear fusion. The binucleate fusion hypha gives rise to uninucleate hyphae which are of different gender, these being produced at different ends of the fusion hypha.

In the second paper the origin of the cultures used is described. The technique employed is outlined, and results and conclusions are summarized. No infection of oat or barley seedlings by pure cultures of smut fungi was found to occur when one gender (sex) is present, but when under like conditions two genders were present infection to the extent of 90 per cent and over was obtained.

The influence of oxygen and carbon dioxide on the growth of Ophiobolus graminis in pure culture, H. FELLOWS (*Jour. Agr. Research [U. S.], 37 (1928), No. 6, pp. 349-355, figs. 5*).—Variations in the destructiveness of take-all in the field and irregularities in some greenhouse experiments suggested an investigation on the effect of different quantities of carbon dioxide and oxygen in the surrounding atmosphere on the growth of *O. graminis*. As a result of his studies the author concludes that variations in carbon dioxide and oxygen as found in arable soils are not great enough to affect materially the growth of *O. graminis*.

Studies of stinking smut control on winter wheat, crop of 1926 [trans. title], A. MAHNER (*Bl. Pflanzenbau u. Pflanzenzüchtung, 4 [1926], No. 3, pp. 81–85*).—In this short preliminary report it is shown that again both Tillantin and Germisan have proved to be practically protective against stinking smut. Other treatments are briefly discussed.

Cereal disease control, F. H. REED (*Canada Expt. Farms, Lacombe (Alta.) Sta. Rpt. Supt. 1926, p. 63*).—A brief summary is given regarding the results of experiments on the control of smut by seed treatment. Apparently, copper-carbonate dust is to be preferred to formalin for wheat smut, both as regards control and freedom from injury. Covered smut in hull-less oats was also successfully controlled with copper carbonate, but formalin is recommended for smut in common oats.

A peculiar winter injury to turf, B. T. DICKSON (*Quebec Soc. Protect. Plants Ann. Rpt., 19 (1926–27), pp. 49–51, figs. 4*).—For some years golf courses in Quebec have shown a form of winter injury which appears wherever a considerable layer of snow is melting. Samples from widely separated sources show the presence of the same fungus, which is supposed to be causal but which has not yet been determined.

Deterioration of abaca (manila hemp) fiber through mold action, F. B. SERRANO (*Philippine Jour. Sci., 32 (1927), No. 1, pp. 75–101, pls. 10, figs. 2*).—Abaca fiber deterioration, noted first in 1902 and frequently since 1920, has been more common in the Bicol region. This trouble is expressed as weakness, brittleness, dark color, and a musty odor, particularly in the case of moist fiber.

Organisms digesting cellulose and thus causing deterioration under conditions favorable to their growth include *Aspergillus flavus*, *A. fumigatus*, *A. glaucus*, *A. niger*, *A. wentii*, *Penicillium glaucum*, *Chaetomium elatum*, *C. funicolum*, *C. olivaceum*, *C. olivaceum chartarum*, and sometimes *Alternaria* sp. Factors conducive to rapid fiber deterioration are abundant moisture content, poor or partial cleaning, long storage of moist fiber, inadequate warehouse ventilation, and careless handling.

Winter injury of alfalfa, F. R. JONES (*Jour. Agr. Research [U. S.], 37 (1928), No. 4, pp. 189–211, pls. 2, figs. 11*).—A detailed account is given of the character of injury to alfalfa roots and crowns that was previously briefly reported by Weimer (E. S. R., 58, p. 241).

The winter injury in plant tissue was found originating in characteristic locations in the parenchyma of the phloem rays, in the central pithlike structure of the upper part of the taproot, and in the xylem. In the spring of 1927 the injury is said to have appeared first as an apparent mechanical disorganization of tissues in plants taken from beneath an ice sheet. The healing of injuries in plants is traced through the spring.

The winter injury when severe is said not only to shorten the life of the plants but to furnish a convenient point of entry for the parasitic bacterium *Aplanobacter insidiosum*, which causes bacterial wilt (E. S. R., 58, p. 46).

A survey of the resistance of subspecies of Brassica oleracea to yellows (Fusarium conglutinans), J. C. WALKER and F. L. WELLMAN (*Jour. Agr. Research [U. S.], 37 (1928), No. 4, pp. 233–241, fig. 1*).—A report is given of an investigation of the comparative resistance to Fusarium wilt of a number of varieties of cabbage commonly grown in the United States, of several European varieties, and of wild and cultivated varieties of *B. oleracea* other than cabbage.

Most of the cabbage varieties commonly grown in the United States were found very susceptible to yellows. A number of European varieties not ordinarily grown in the United States were found to possess various degrees of resistance. The wild cabbage of Europe was highly resistant, but selfed progenies from individual plants showed that about one-fourth of the plants were diseased. Brussels sprouts and broccoli, though showing a considerable number of plants slightly affected, were not seriously damaged by yellows. Varieties of cauliflower were found to vary somewhat in reaction, but, in general, they were more damaged than broccoli or Brussels sprouts. Kale varieties differed widely in susceptibility, the Siberian kale being very resistant, while the curled-leaf types were very susceptible. The smooth-leaf varieties and the collards occupied an intermediate position. Kohlrabi varieties were all very susceptible.

Within all of the forms tested a number of individuals survived, indicating the possibility of improving resistance through selection.

The downy mildew of the hop, E. S. Salmon and W. M. Ware (*Wye, Kent: South-Eastern Agr. Col., 1927, pp. 28, figs. 7*).—The hop downy mildew organism (*Pseudoperonospora humuli*) was first observed in Japan in 1905, in America in 1909, and at Wye in 1920. In 1922 and 1923 it reappeared at Wye in larger amounts. In 1923 it was found in considerable quantity in Germany and Yugoslavia. The mode or means of its entrance into Europe appears not to be known.

Chapters deal with the life history of the fungus, the course of the disease in England in 1927, resistance and susceptibility, losses (estimated) caused in 1927, methods of control, and course of events on the Continent in 1927.

The spores produced on the basal spikes, often in great quantity, constitute the chief source of infection. Removal of parts serving as infection sources proved sufficient in 1926 to prevent attack on the cones, but insufficient in 1927. Spraying measures recommended. along with other suggestions, include 1 per cent homemade Bordeaux mixture applied when the bines are three-fourths up the strings or poles, when they have reached the top, just before the plants come into bur, and immediately after the bur has gone.

A Fusarium wilt of peas in Wisconsin, M. B. Linford (*Wisconsin Sta Research Bul. 85 (1928), pp. 44, figs. 15*).—In a previous paper (E. S. R., 58, p. 550) the author reported the occurrence of a Fusarium wilt of peas that was a cause of important pea failures in Wisconsin.

Field, greenhouse, and laboratory investigations were continued on this disease, and the cause was found to be a new variety, which is technically described as *F. orthoceras pisi*. The temperature, moisture, and soil relations; pathogenicity; and means of dissemination were determined, and suggestions are given for the control of the disease. The optimum temperature for the development of the disease was found to be very near that for the growth of the healthy pea plant. Soil moisture had less influence on the wilt than temperature. Wet soils appeared to favor the early development of disease symptoms, but drier soils seemed to favor more rapid death of affected plants. Early planting favored the early seasonal development of the disease, and plants that had grown to the five-node stage in soil too cool for the disease did not acquire any effective resistance when the soil temperature was raised.

Varietal differences in susceptibility were observed, and among the susceptible varieties resistant plants were found. Some of these have yielded resistant progenies for further study.

Among the recommendations for the control of the wilt the author suggests the rotation of crops, avoiding the planting of peas where failures from disease have occurred, the transfer of soil from infested to clean fields, or the planting of seed grown on infested fields. Pea refuse should not be used as a manure where peas are ever to be grown. Resistant varieties may be planted where wilt occurs by itself or where other diseases are of minor importance, but they are not dependable where root rot occurs severely with wilt.

Potato blight control [trans. title], E. F. S. SHEPHERD (*Rev. Agr. Maurice, No. 32 (1927), pp. 65, 66*).—Brief details are given of preliminary trials of Burgundy mixture for potato blight in Mauritius, where during the wet period, July–September, great damage is usually caused.

The first spray (4–5–40 Burgundy mixture) was applied 1 month after the planting (early in June) and others at intervals, respectively, of 12, 9, 7, 8, 6, 8, and 10 days to September 9. Such application is thought to be profitable. Other tests are outlined in connection with costs.

The introduction and distribution of canker-immune potato varieties [trans. title], A. MAHNER (*Bl. Pflanzenbau u. Pflanzenzüchtung, 4 [1926], No. 2, pp. 52–56*).—Qualities and distribution of canker-resistant potato stocks are briefly outlined.

The production of mosaic-free Triumphs, A. G. TOLAAS (*Amer. Potato Jour., 3 (1926), No. 9, pp. 301, 302*).—In the winter of 1924 an attempt to develop some new Bliss Triumph foundation stock was begun. Tubers were selected from the 1924 digging and a half tuber from each hill unit was grown in the greenhouse. Of the mosaic-free hill units 35 were obtained. These were planted on an isolated plat in 1925, and the plat was carefully inspected several times during the growing season without discovering any mosaic. Each hill (harvested separately) yielded about 40 lbs. of potatoes, and these, after being stored over winter, were given out to growers in 1926. Inspection of nearly all of these plats showed no mosaic.

Other information is given of efforts tending to make the production of mosaic-free potatoes general.

Net necrosis of the potato tuber, A. H. GILBERT (*Amer. Potato Jour., 4 (1927), No. 8, pp. 90–92*).—Noting that potato tubers showing net-necrosis produce invariably leaf roll plants, and that while leaf roll symptoms persist in the progeny plants the tuber necrosis is not persistent but appears to be a first season symptom following initial leaf roll infection, the author states that further experiments are under way and that miscroscopic study of the necrotic tuber tissues is giving further information as to the particular cells affected in net-necrosis. The results show that the net-necrosis of the tuber is properly a phloem necrosis, since the phloem strands of the vascular system are so affected. The disease is presumably an effect of the assumed leaf roll virus. Since the phloem strands are the active conducting channels of the tuber, any substance toxic to the tuber, introduced for example by aphids, would be distributed along these channels. Some results noted are tentatively considered in this connection.

Identifying spindle-tuber in the field, H. O. WERNER (*Amer. Potato Jour., 4 (1927), No. 8, pp. 89, 90*).—Experience during nine years at the University of Nebraska suggests that spindle tuber occurs in all potato regions, but more commonly in some places than in others, though growers in some regions may not have learned to identify the disease under local conditions as environment plays a great part in altering symptoms. The author attempts to describe symptoms as observed under central western plains conditions, where the climatic conditions range, in portions, from a typical Corn Belt climate to a relatively cool mountain climate. It is thought possible that the symptoms described may represent different stages of severity of the same disease or that possibly they may indicate two or more distinct diseases not yet separately identified.

The results of eight years of practical potato spraying in Pennsylvania, E. L. Nixon (*Amer. Potato Jour., 3 (1926), No. 11, pp. 349, 350, 352, 353, figs. 2*).—As a result of the demonstrations indicated, it is concluded that in Pennsylvania, considered a border State from the standpoint of potato spraying, spraying is the most profitable operation in connection with potato growing. Seven applications are more profitable than six. Weather conditions are more important than the observance of stated intervals. Minimum requirements include three adjustable nozzles per row, a 200-lb. pressure, and 100 gal. per acre for each application. Homemade Bordeaux mixture is the most economical and most effective material for spraying. Standardized machinery is an important need.

The beet eelworm (Heterodera schachtii (Schmidt)): Its life history when found on hops in this country, C. A. W. Duffield (*Jour. Southeast. Agr. Col., Wye, Kent, No. 24 (1927), pp. 56–58, fig. 1*).—During the investigations which have been noted (E. S. R., 59, p. 644), it was found that the life history of the beet nematode (*H. schachtii*) was different when hop was the host plant. While on the Continent several generations occur in beet, in England there is only one generation on hop. The method employed and the life history of each sex are outlined.

Results of treating sweet-corn seed with mercury compounds, E. S. Haber (*Canning Age, 8 (1927), No. 9, pp. 679–682, 700, figs. 8*).—Treatment with organic mercury compounds did not influence germination and subsequent yield in the case of disease free sweet corn seed. Such treatment increased germination and yields from seed infected with Diplodia. Dusts are more practical for treating large lots than liquids, because of the need for the afterdrying. Seed treatment may be advantageous in cold, wet planting seasons.

Tobacco diseases in Mauritius in 1926 [trans. title], G. Corbett (*Rev. Agr. Maurice, No. 32 (1927), pp. 66–69*).—Of tobacco diseases in Mauritius, the greatest loss is caused by mosaic, of which two allegedly distinct types are described. Granville wilt (*Bacterium solanacearum*) is also dealt with in brief detail.

Spotted wilt of tomatoes, J. H. Simmonds (*Queensland Dept. Agr. and Stock, Path. Leaflet 1 (1927), pp. 3, pl. 1*).—Considerable losses to tomato growers in some localities in Queensland are reported as due to a tomato disease which is said to have appeared first in Victoria in 1915–16, and to which the name spotted wilt has been applied on account of its characteristic symptoms. This has now been reported from all of the Australian States. The trouble is described. Repeated efforts to find a causal organism have had no success. The disease is thought to be similar to a Canadian disease known as streak, which has been studied by Vanterpool (E. S. R., 58, p. 656) and which is said to have been recently shown by him to belong to the virus type of disease. It is thought probable that in the case of tomato spotted wilt certain insects carry the virus. No certain control measures have yet been demonstrated, but loss may be reduced by frequent inspection and removal of diseased tomato plants or residues, spraying for possible insect carriers, and avoidance of strong nitrogenous manures tending to produce excessively vigorous succulent growth.

Fruit tree disease and pest control [trans. title], K. Schubert and K. Richter (*Angew. Bot., 8 (1926), No. 3, pp. 146–167, figs. 5*).—A study is reported and discussed of experimental measures looking to the control of apple mildew (*Podosphaera leucotricha*) and some other fruit tree diseases and pests.

A note on the "bud-rot" of apple trees, W. A. R. Dillon-Weston (*Brit. Mycol. Soc. Trans., 12 (1927), pt. 2–3, pp. 170–172*).—A brief discussion of apple tree bud rot furnishes a list of apple trees susceptible to attack by the fungus, which is stated in a quoted personal reply from Wollenweber to be probably *Fusarium fructigenum*, likely identical with *F. gemmiperda*.

"In the Isle of Ely, Emneth Early is the variety of apple tree most susceptible to this disease, and during the spring of 1925, 30–50 per cent of the buds were sometimes affected. Lord Grosvenor also is attacked very severely, Grenadier less severely, Lane Prince Albert and Lord Derby moderately, and Bramley Seedling, Newton Wonder, and Worcester Pearmain slightly. The climatic conditions that favor the intensity of this disease appear to be a wet summer and autumn, because following the wet summer and autumn of 1919 and 1924 there were severe attacks of bud rot in the spring of 1920 and 1925. The dry summer of 1921, however, considerably checked the disease."

Studies on the etiology of apple crown gall, E. A. Siegler (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 5, pp. 301–313, figs. 6*).—An account is given of studies with the apple strain of the crown gall organism, *Bacterium tumefaciens*, isolated from the woolly-knot type of crown gall. These isolations are said to have consistently yielded an organism which appeared to be identical with that described by Smith et al. as the apple strain of *B. tumefaciens* (E. S. R., 25, p. 243). When the Paris daisy, apple shoots, sugar beet, and Bryophyllum were inoculated with the apple organism, definite and pronounced galls or malformations were produced, but when tomato and tobacco were inoculated with the organism no definite galls were formed, although slight disturbances of the tissues occurred on these hosts. When apple shoots were inoculated with the apple organism, malformations identical with the so-called aerial crown gall were produced and the organism reisolated.

The author claims that the degree of pathogenicity of this strain of *B. tumefaciens* exhibited on apple shoots and on hosts other than the apple does not necessarily prove its rôle as a pathogene in connection with malformations on the roots of grafted apple trees, nor does its constant association with these malformations furnish conclusive proof that it is the causal agent. It is claimed that the facts given support the hypothesis that the apple strain of *B. tumefaciens* can cause certain types of malformations or galls that occur on root-grafted apple trees.

Studies on Podosphaera leucotricha (Ell. & Ev.) Salm.—I, The mode of perennation, R. C. Woodward (*Brit. Mycol. Soc. Trans.*, *12* (*1927*), *pt. 2–3, pp. 173–204, pls. 2, fig. 1*).—Apple mildew (*P. leucotricha*), widespread and for many years an orchard pest, has recently become, in England, a factor of great economic importance, and this fact has led to a reinvestigation of portions of its life history relating to its continual reoccurrence and to more detailed observations upon its method of parasitism.

It is stated that *P. leucotricha* perennates by means of hyphae and haustoria within dormant apple buds. Young axillary buds are invaded soon after their formation when the buds are inadequately protected by bud scales. Terminal and axillary buds on one-year wood and blossom buds on spurs are most frequently invaded. Other details are given.

"Secondary" infection has been overemphasized, as no general infection arises other than that which develops from infected buds. Occasionally fresh foliage induced by die-back brought about by severe mildew attack or by the capsid *Plesiocoris rugicollis* extends infection. Browning of the leaves appears to be due principally to the death of tissues caused by toxins set up by encapsulated haustoria. No specialized races were encountered. Apple varieties vary in susceptibility. The prevention of bud infection by spraying has not succeeded.

Notes on the canker fungus (Nectria galligena Bres.), W. A. R. Dillon-Weston (*Brit. Mycol. Soc. Trans., 12 (1927), pt. 1, pp. 5–12, pls. 3*).—This outline report of studies on shriveled Worcester Pearmain apples bearing perithecia of *N. galligena*, on an eye rot of Worcester Pearmain apples caused by the conidial stage of *N. galligena*, on the wilting of Worcester Pearmain blossom trusses, and on pear canker states that one method of overwintering of the apple canker fungus (*N. galligena*) is by the formation of perithecia upon shriveled fruits. The Fusarium stage of canker (*F. willkommii*) causes eye rot of Worcester Pearmain. Evidence shows that one case of wilting of Worcester Pearmain blossom trusses was due to the canker fungus, but no explanation is offered as to the mode of infection.

An unusual form of pear canker is also described.

The Japanese beetle an agent in spreading the brown rot of peaches, G. W. Martin (*Penn. Acad. Sci. Proc., 1 (1924–1926), p. 113*).—The author reports having proved beyond all doubt that the Japanese beetle is a common carrier of the disease known as brown rot among fruits, particularly the peach. Other diseases than the brown rot are said to be carried by this insect, since many experiments showed the presence of other spore-bearing fungi, such as the spores of Alternaria, Penicillium, Rhizopus, Gloeosporium, Fusarium, as well as the yeasts, bacteria, etc.

From the many experiments performed the author concluded that the fruits under experimentation, with the apple probably excepted, can become inoculated with the brown rot disease without any lesions occurring on the epidermis. When lesions are caused by the mechanics of insects, hail, or otherwise, no doubt the inoculum gains headway much earlier and develops more rapidly toward complete infection and decay. The wind, however, is said to be the greatest factor in the distribution of the spores.

The parasitism of Plowrightia ribesia on the currant, I. A. Hoggan (*Brit. Mycol. Soc. Trans., 12 (1927), pt. 1, pp. 27–44, pls. 4, figs. 2*).—Infection of currant by *P. ribesia* is caused by ascospores liberated into the air in early summer through a highly specialized spore discharge mechanism and disseminated chiefly by wind. Infection occurs mainly through spurs left in pruning, the fungus acting as a weak wound parasite. Normal, healthy branches are not susceptible to infection, though dying branches may be infected by artificial inoculation. The disease occurs commonly in English gardens and, though not usually very severe, reduces yield, owing to the loss of certain of the branches, which may even cause the death of the entire bush.

The simple control measures are to prune back to the surface of the parent branch, instead of leaving snags, and to remove all infected branches, since these serve to overwinter the fungus and start the trouble the following season Cultural practices tending to keep the bushes in a healthy and vigorous condition are also of value.

Notes on Nectria rubi, I, II, G. H. Pethybridge and R. M. Nattrass (*Brit. Mycol. Soc. Trans., 12 (1927). pt. 1, pp. 20–27*).—The first part of this account, by Pethybridge, records work said to have been done a few years previously in Ireland by Pethybridge and H. A. Lafferty in connection with a fungus regarded as identical with *N. rubi*. It has been thought that this Nectria may have a Fusarium as one stage of its life history. The question as to the parasitism of *N. rubi* still remains to be settled. The same fungus is thought to have been discovered on sick raspberry plants in Scotland and in England.

In the second part, a note is contributed by Nattrass on the occurrence, during the previous two years, of *N. rubi* in England. This is described. It is stated that though sporodochia of the Fusarium stage of *N. rubi* have been observed by A. Osterwalder and by Pethybridge and Lafferty on the roots of diseased raspberry plants, they have not thus far been observed on specimens found in England. Isolations from the inner tissues of roots, however, have yielded violet-colored mycelium producing conidia identical with those formed in the cultures derived from ascopores. Nattrass states that he has found another fungus of the Fusarium type on diseased raspberry roots. This is partly described.

Grape downy mildew, A. Gascon y Miramon (*El Mildiu de la Vid. Madrid: Min. Fomento, Dir. Gen. Agr. y Montes, Serv. Pub. Agr., [1927], pp. 64, figs. 2*).—This is a general descriptive account of grape downy mildew (*Peronospora viticola*).

Tropical fusaria, O. A. Reinking and H. W. Wollenweber (*Philippine Jour. Sci., 32 (1927), No. 2, pp. 103–253, pls. 6, figs. 47*).—Most of the fungi described belong to sections that have parasitic species causing wilts, rots, and decays, though for the greater part the parasitic nature of the species described has not yet been established. Indications include sources and methods of isolation, morphological and physiological studies, and a systematic arrangement of species of Fusarium, with descriptions of genera, sections, species, varieties, and forms.

Damping-off in Citrus seed beds [trans. title], J. Reichert (*Zion. Exec., Agr. Expt. Sta. and Colon. Dept. Ext. Leaflet 20 (1927), pp. 8, fig. 1; Eng. abs., p. 8*).—Damping-off in Citrus seed beds is described as causing widespread loss in parts of Palestine, including Judea, Samaria, and the Valley of Jezreel. *Fusarium* sp., *Rhizoctonia* sp., and *Alternaria* sp. have been isolated from diseased plants.

Control measures recommended include the avoidance of very early planting, the use of light soil for the seed bed with a cover (1 to 3 cm.) of loose sand, cold seed beds (or uninclosed hotbeds loosely covered with *Poterium spinosum* bushes), plenty of light and air, not too thick seeding, dryness of surface soil, the use of fresh soil for each seed bed (or disinfection with formalin or hot water), and the application of 0.5 per cent Bordeaux mixture to young seedlings.

"As soon as the disease is observed the humidity should be lessened by stopping irrigation, removing covers, and spreading a layer of sand over the soil. The diseased seedlings with the surrounding soil should be discarded, and the rest of the infected soil should be treated with a 2 per cent Bordeaux mixture. The remaining healthy plants should then be treated with a 0.5 per cent Bordeaux mixture."

The isolation of the fungus that causes citrus melanose and the pathological anatomy of the host, W. J. Bach and F. A. Wolf (*Jour. Agr. Research [U. S.], 37 (1928), No. 4, pp. 243–252, fig. 1*).—The authors report a study of 115 isolations made from leaves, twigs, and fruits of citrus, from which it was determined that melanose lesions are caused by *Diaporthe citri*. The direct penetration of the conidial germ tubes was observed, and the mycelium was found to be intercellular, the tissues disintegrating in advance of the hyphae. Gummosis, which is the result of enzymotic action, and suberization, which is a wound response, were found to occur in the formation of melanose lesions.

Contribution to the study of the crown disease of the oilpalm (Elaeis guineensis Jacq.), C. Heusser (*Commun. Gen. Expt. Sta. Alg. Ver. Rubberplanters Oostkust Sumatra, Gen. Ser. No. 31 [1927], pp. 34, figs. 18*).—Investigations on the so-called crown disease of the oil palm, started as early as 1921, pointed to a nonparasitic origin, which view later studies have not disproved. The majority of the diseased palms recover without treatment and without ill aftereffects. Not all plants are attacked. Apparently, crown disease is a nutritional physiological disorder, but neither cause nor appropriate treatment has yet been worked out. The indirect cause is to be sought in the composition of the nutrient solution in the soil.

An account is given of experiments started in 1922 on the symptoms and progress of the disease, and an account of this study and its results are detailed.

An outbreak of blister blight in the Surma Valley, A. C. TUNSTALL (*Indian Tea Assoc., Sci. Dept. Quart. Jour., 1927, No. 1, pp. 20–24*).—Though reports alleging the presence of tea blister blight in the Surma Valley before 1926–27 had been shown to be incorrect, specimens received in the cold weather of that period from two widely separated areas showed this blight (*Exobasidium vexans*), which was supposed to have arisen from spores introduced about November 15. It was thought that the disease had been distributed all over the north of the Surma Valley. An account of the investigation is detailed, and control procedure is outlined.

A Penicillium rot of Gladiolus, J. E. MACHACEK (*Quebec Soc. Protect. Plants Ann. Rpt., 19 (1926–27), pp. 77–86, figs. 10*).—A rot of Gladiolus is discussed regarding its association with a Penicillium supposedly undescribed hitherto. This is considered a new species and is described under the name *P. gladioli*.

A common leaf spot of Iris in Quebec, C. PERRAULT (*Quebec Soc. Protect. Plants Ann. Rpt., 19 (1926–27), pp. 87–103, pls. 6*).—A study undertaken in view of the prevalence of a leaf spot disease or diseases of Iris is discussed. The organism associated causally with this trouble is said to be the fungus *Heterosporium gracile*. The beardless iris appears to be immune. A list is given of susceptible varieties.

On the occurrence of Diaporthe perniciosa or a closely related form on lilac, F. C. DEIGHTON (*Brit. Mycol. Soc. Trans., 12 (1927), pt. 1, pp. 70–73*).—It is stated that in the absence of positive infections the evidence for the parasitism of Diaporthe on lilac is as unsatisfactory as is often the case with fruit trees. It is, however, considered probable that under favorable conditions, as dense shade, this Diaporthe can attack at least that part of the wood that is not functioning actively. The attack occurs on the side having no large living branches.

It is thought possible that some other fungi, as *Fusarium* sp., may help in the attack on lilac. In most cases investigated the other fungi were clearly secondary, whatever part the Diaporthe may have played.

No extensive work was carried out on wound gum formation in lilac, but such formation was found to follow in the main the same course as in plum and peach that has been described by Swarbrick (E. S. R., 55, p. 237), and by Brooks and Moore (E. S. R., 59, p. 449).

Fatal bacterial diseases of elm and other deciduous trees [trans. title], A. BRUSSOFF (*Mitt. Deut. Dendrol. Gesell., No. 38 (1927), pp. 244–251, pls. 4*).—This account gives the results of studies, largely observational, with a list of related publications by the author and a few others.

Diseases and pests in seed beds of the more important forest tree species [trans. title], E. MANSHARD (*Mitt. Deut. Dendrol. Gesell., No. 38 (1927), pp. 198–229, pls. 2*).—A systematic account, with bibliography, is given regarding attacks by both animal and plant parasites, also regarding nonparasitic injuries of important forest tree seedlings.

Root knot or nematode root gall, R. VEITCH (*Queensland Dept. Agr. and Stock, Ent. Leaflet 9 (1927), pp. 7, pls. 2*).—The chief entomologist gives a brief account of the nematode (*Heterodera radicicola*) responsible for root galls, indicating measures promising some relief, including "a judicious combination of thorough cultivation and heavy manuring."

ECONOMIC ZOOLOGY—ENTOMOLOGY

Laws and regulations relating to game, land fur-bearing animals, and birds, in Alaska, 1928–29 (*U. S. Dept. Agr., Bur. Biol. Survey, Alaska Game Comn. Circ. 5* (*1928*), *pp. II+30, figs. 2*).—The Alaska laws and regulations for 1928–29 are here brought together (E. S. R., 58, p. 855).

Fur laws for the season 1928–29, F. L. Earnshaw and F. G. Grimes (*U. S. Dept. Agr., Farmers' Bul. 1576* (*1928*), *pp. II+29*).—This is the fourteenth revised edition of the laws relating to fur animals (E. S. R., 58, p. 252).

Insect food of Kansas lizards with notes on feeding habits, C. E. Burt (*Jour. Kans. Ent. Soc., 1* (*1928*), *No. 3, pp. 50–68*).—This is a report of studies made during the years 1924 to 1926 of 12 species, including all of the common lizards occurring in Kansas. Due to the availability of material, two species, *Crotaphytus collaris* and *Cnemidophorus sexlineatus*, were studied in greater detail than any of the others. The data obtained have been from a review of the literature, feeding experiments and observations, and stomach examinations.

A summary of the analyses of the stomach contents of 49 lizards here reported shows 51.92 per cent to have been Orthoptera, 11.65 per cent Lepidoptera, 9.35 per cent Arachnida, 8.90 per cent Hymenoptera, 6 per cent Coleoptera, 4.76 per cent Diptera, 4.34 per cent Hemiptera, 1.73 per cent vegetable matter, 0.87 per cent Mollusca, 0.45 per cent Homoptera, and 0.03 per cent Trichoptera.

The account concludes with a list of 25 references to the literature cited.

Earthworms as pests and otherwise, W. R. Walton (*U. S. Dept. Agr., Farmers' Bul. 1569* (*1928*), *pp. II+14, figs. 6*).—This is a practical summary of information on earthworms, both useful and injurious. An account is given of their life history and habits, uses, methods of collection, storing and rearing, preparation for angling or market, natural enemies, and means of combating them when they become a nuisance.

The important worm parasites of farmyard animals in Germany, A. Koegel (*Die Wichtigsten, Gesundheitsschädlichen Würmer der Landwirtschaftlichen Nutztiere in Deutschland. Stuttgart: Ferdinand Enke, 1925, pp. VIII+104, figs. 92*).—This is a practical well-illustrated account of the most important nematodes, flukes, and tapeworms of the farmyard animals.

The ectoparasites: Their effect upon domestic animals in Germany and means of control, A. Koegel (*Das Ungeziefer: Seine Wirtschaftliche Bedeutung für die Deutsche Nutztierhaltung and die Wichtigsten Bekämpfungsmethoden. Stuttgart: Ferdinand Enke, 1925, pp. VIII+75, figs. 53*).—A practical account of the acarids, a linguatulid, and insects that attack the domestic animals, and means for their control.

[Work in zoology and entomology at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 230* (*1928*), *pp. 39–43, fig. 1*).—Brief mention is made of a severe infestation in a sweet pea greenhouse by a garden symphilid, *Scutigerella immaculata* Newp., a series of experiments with which was undertaken by C. A. Thomas. Steam sterilization of the soil of the greenhouse by the use of underground tiles was partially successful. The soil temperature rose above 160° F., but many of the symphilids escaped by entering cracks in the concrete walls of the beds. Also the soil was somewhat too moist for complete penetration by the steam. A list is given of the substances found ineffective against these symphilids, injuring small Centurea seedlings in a greenhouse.

Reference is made to a paper by S. W. Frost (E. S. R., 59, p. 857), dealing with work with cold-mixed oil emulsions. A high percentage of kill of rosy aphid on apple resulted when heavy applications of 3 per cent engine oil emulsified with calcium caseinate were applied. Under ordinary orchard spraying only 60 to 70 per cent kill resulted. This 3 per cent emulsion was also found effective against the red spider.

In investigations by Frost (E. S. R., 58, p. 344) with baits for the control of the oriental fruit moth, the largest catches were obtained with a molasses-water-sodium arsenite bait. This bait is said to be effective for at least 16 weeks without the addition of anything except water occasionally to compensate for evaporation. Molasses 1 part and refiners sirup 20 parts works better during the cool weather in spring, and the less active sodium arsenite bait is better during the hot summer.

Studies of the biology and life history of wireworms affecting truck crops were continued by Thomas. The wireworms reared to adult stage include *Pheletes agonus* Say, the common truck crop wireworm of southeastern Pennsylvania, which attacks the roots of beet, carrot, cabbage, radish, turnip, lettuce, spinach, etc., and the seeds of corn, wheat, parsnip, carrot, and bores into the stems of young celery plants; *Monocrepidius lividus* (De G.); *Hemicrepidius decoloratus* (Say); *Melanotus communis* (Gyll.); and adults not yet identified from the following genera: Athous, Elater, Limonius, Melanotus, and Monocrepidius. Small-scale experiments with granular calcium cyanide, after a bait, again gave good results gainst *P. agonus* larvae. Studies are being made of the effect of the cyanide gas upon various truck crops. Wireworms boring up into small celery plants were largely controlled by uncovering the base of the plants with a hoe or cultivator, the wireworms thus being driven down into the more moist soil beneath the plant, as these larvae die quickly in hot, dry soil.

Studies of the biology of flies and mites infesting mushrooms were continued by Thomas. In the laboratory, at temperatures between 62 and 68° F., the mushroom Sciara went through its entire life cycle from egg laying to emergence of the adult fly in an average of 23 days. The several brands of pyrethrum powder tested were found to vary considerably in toxicity, and it is concluded that only the best grades, guaranteed to be made from pyrethrum flowers, should be used against the mushroom flies. Paradichlorobenzene, placed in or on the manure previous to casing, was toxic to mites, but none of the treated bays produced more than an average crop and several bays were considerably retarded. In laboratory experiments, fumes of formaldehyde had no effect upon Sciara flies and mites, while burning sulfur was very toxic to both. Several tobacco dusts were very slowly or not at all toxic to mites. The fumes of carbon tetrachloride were quite toxic to both flies and mites, but many recovered unless the exposure to the vapor was prolonged. In the mushroom house, powdered naphthalene spread upon the casing soil considerably retarded the growth of mushrooms.

Work with the European corn borer, briefly reported upon, includes a study of mechanical methods of control commenced in cooperation with the department of farm machinery. The results obtained in a comparison made of the walking plow with chain and wire with three different tractor plows in covering stalk débris are reported upon in tabular form. Rating the 14-in walking plow with chain and wire as 100 per cent efficient, the two-bottom plow with trash shields on tractor was 156 per cent efficient.

A substitute for arsenic, S. Marcovitch (*Sci. Mo., 27 (1928), No. 5, pp. 459–462*).—This is a contribution from the Tennessee Experiment Station in which the importance of sodium fluosilicate is pointed out.

The sorghum midge, with suggestions for control, C. H. Gable, W. A. Baker, and L. C. Woodruff (*U. S. Dept. Agr., Farmers' Bul. 1566 (1928), pp. II+10, figs. 11*).—This is a practical account of a pest which causes American farmers a loss of millions of dollars each year in the damage which it inflicts on the grain sorghums, and great losses also in the seed crops of other sorghums, broomcorns, and Sudan grass. The account includes instructions for reducing the losses caused by the pest, and lessening or avoiding infestation.

America's corn crop and the corn borer, W. H. Larrimer (*Sci. Mo., 27 (1928), No. 5, pp. 424–433, figs. 7*).—This is a practical summary of information on the European corn borer situation.

Weather and the cotton boll weevil, J. B. Kincer (*U. S. Mo. Weather Rev., 56 (1928), No. 8, pp. 301–304, fig. 1*).—This is a correlation of data on the weather and boll weevil occurrence obtained in the Cotton Belt States since infestation by the pest, namely, Texas, Louisiana, and Mississippi for 15 years, Alabama 12 years, and Georgia, Arkansas, and Oklahoma 10 years. The weather data used, which are brought together in tabular form, include (1) relative humidity, concurrent year; (2) number of days with rainfall, concurrent year; (3) number of cloudy days, concurrent year; (4) rainfall, concurrent year; (5) lowest winter temperature, preceding winter; (6) relative humidity, preceding year; (7) percentage of possible sunshine, preceding year; (8) number of days maximum temperature 90° F. or higher, preceding summer; and (9) rainfall, preceding year. The computed weevil damage from the weather data and the estimated reduction in yield reported by the U. S. Department of Agriculture are given in the table. The relation between the damage by the weevil computed from weather data for the above-mentioned States and the actual damage as computed by the Department of Agriculture is shown in chart form.

Lasius interjectus Mayr (Formicidae), a household pest in Kansas, R. C. Smith (*Jour. Kans. Ent. Soc., 1 (1928), No. 2, pp. 14–18*).—Following a review of the literature on this ant, which appears to be a new household pest and is apparently on the increase in Kansas, observations of its life history made in that State are reported.

Nesting habits of some anthidiine bees, C. P. Custer and C. H. Hicks (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 52 (1927), No. 4, pp. 258–277, fig. 1*).—It is pointed out that no females of *Anthidium porterae* have ever been found digging a nest, the nests of wasps or other insects being used. Several instances of female bees of *Dianthidium sayi* working alternately on two nests in the process of construction are recorded. It is pointed out that this has also been observed to occur in *Sphex varipes*. It was found that the resin used in the construction of the nest was obtained from the leaves and stem of the small sunflower, *Helianthus petiolaris*. *D. sayi* is said to be one of the wild bees whose members nest in close association with one another. This species was found to be nearly free from parasitism.

ANIMAL PRODUCTION

Livestock husbandry on range and pasture, A. W. Sampson (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. XXI+411, pl. 1, figs. 115*).—A treatise on the economic management and production of the different kinds of livestock on range and farm pasture. The subject matter is divided into four main headings: (1) Range history and livestock improvement, (2) pasture husbandry of sheep and goats, (3) pasture husbandry of beef cattle, and (4) economics of pasture livestock.

Early grazing ruins the ranges, H. C. Hanson (*Cattleman, 15 (1928), No. 6, pp. 31, 32.*)—In this article from the Colorado Experiment Station, the author shows the injurious effects to both plants and soil that accompany early spring grazing. It is also pointed out that the danger from poisonous plants is more prevalent at this time than at any other time of the year. Delayed grazing is a means of combating poisonous plants, since other vegetation when given the opportunity crowds out the obnoxious plants which can not endure competition.

Increasing productivity of pasture lands, A. E. Aldous (*Cattleman, 14 (1928), No. 10, pp. 71, 73, 75, 77*).—Studies were undertaken at the Kansas Experiment Station to obtain information for increasing the productivity of pastures. The studies are divided into two parts: (1) Management of livestock, and (2) burning.

Under the first part a system of deferred or rotation grazing has been followed, in which one pasture is protected during the first part of the season, while the other is grazed. After two years the grazing arrangement is reversed. Under this system of management at least 70 per cent higher grazing capacity has been obtained. Also a significant improvement of the pasture was noted as compared with season-long grazing. The native vegetation responded readily to either light grazing or protection until it had partially completed its annual growth. The extra cost of fencing for this system is usually more than offset by the increased grazing capacity.

The second part of the work has demonstrated that burning does stimulate earlier spring growth. Twenty per cent more grass was found on burned areas on May 1, 25 per cent more the middle of May, and 15 per cent more on July 1 than on unburned areas. Part of this growth is due to the increased soil temperature on the burned areas. Records for five years show temperatures 4.6° F. higher at 1 in. depth and 4.2° higher at 3 in. depth on the burned areas as compared with unburned. On the average the unburned plats yielded 15 per cent more hay for the year than the burned plats. However, there were fewer weeds on the burned areas. The time of burning proved to be a big factor in weed and brush control. May burning eliminated practically all the weeds and effectively combated sumac and buck brush. The type of native grasses grown on burned areas was also influenced by the time of burning. Practically all the growth on fall and early spring burned areas was little bluestem and on May burned plats big bluestem. Burning as late as May tended to reduce the density of vegetation. Kentucky bluegrass and the sedges were effectively checked by burning.

Modern green fodder preservation.—An adviser for silo questions, L. F. Kuchler (*Die Zeitgemässe Grünfutterkonservierung.—Ein Ratgeber für Silofragen. Freising: F. P. Datterer & Co., 1926, pp. XVI+525, figs. 151*).—This is a rather exhaustive practical monograph opening with a brief historical introduction. The primary topics discussed are as follows: The origin of the silo idea; the significance of modern silage preparation for the German estate farm; the newer principles and problems of silage preparation; technical fundamentals of silage preparation; normal fermentation in pits and towers; processes of fresh fodder pressing; processes for obtaining sweet green fodder with the help of added substances; the question of economy and choice of silo processes; the utilization of the silo in agriculture; and notes from practice. The book contains also a source list of references (pp. 447–462), an appendix of illustrations, and an adequate index.

Composition of cottonseed hull bran, K. S. Markley (*Jour. Amer. Soc. Agron., 20 (1928), No. 10, pp. 1102–1107*).—From analyses of cottonseed hull bran, in which were determined, in addition to moisture and ash, the content of crude fat, crude protein, crude fiber, the nitrogen-free extract, the furfural yield, the pentose and pentosan calculated from the furfural, dextrose, sucrose, galactose, reducing sugar after hydrolysis calculated as dextrose, and the same calculated as xylose, crude cellulose, and lignin, together with an analysis of the crude cellulose for ash, pentosan, alpha-cellulose and beta-cellulose, it is concluded "that cottonseed hull bran is a more valuable product than was heretofore thought to be the case." Furfural amounting to 22.28 per cent on the air-dry, or 25 39 per cent on the oven-dry, basis; xylose with other pentoses amounting to about 40 per cent; and crude cellulose amounting to 51 per cent, were among the products obtained.

Growth on a synthetic ration containing small amounts of sodium, J. L. St. John (*Jour. Biol. Chem., 77 (1928), No. 1, pp. 27–32, figs. 3*).—Continuing the study of synthetic diets (E. S. R., 60, p. 168) at the Washington Experiment Station, rats were fed a basal ration complete in every respect except that sodium carbonate was eliminated from the salt mixture. To the basal ration was added sodium to the extent of from 0.02 to 0.5 per cent. On rations containing 0.3 per cent or less of sodium rats grew rapidly for a few weeks and then declined in weight, many of them dying in 10 to 12 weeks. The eyes of animals on the smaller allowances of sodium were seriously affected and blindness resulted in many cases, also their general condition was poor. The animals receiving more than 0.3 per cent of sodium grew well, were in good condition, and their eyes were not affected. There was no reproduction on any of the rations used, due probably to the lack of vitamin E.

The energy metabolism of cattle in relation to the plane of nutrition, E. B. Forbes, W. W. Braman, M. Kriss, et al. (*Jour. Agr. Research [U. S.], 37 (1928), No. 5, pp. 253–300, figs. 4*).—The Pennsylvania Experiment Station conducted a series of metabolism studies to find the relation of energy metabolism to the plane of nutrition. These studies were conducted in duplicate on 2 2-year-old steers at 5 levels of feed, namely, 1 at fast, 1 at half the maintenance requirement, 2 at maintenance, 1 at half more than maintenance, and 1 at twice the maintenance requirement. The ration used was corn meal and alfalfa hay, equal parts, except in one test at maintenance when alfalfa hay alone was fed. Both direct and indirect methods of respiration calorimetry were used for determining energy metabolism. Each digestion trial consisted of a 10-day preliminary period and an 18-day period when all visible excreta were accounted for, the last 3 days of this part being a continuous respiration calorimetric period, during which the heat production and gaseous metabolism were measured. Several new procedures differing from work previously noted (E. S. R., 58, p. 763) are discussed in connection with the computations in which they are involved. Curves were plotted of the distribution of feed energy per kilogram of dry matter between feces, urine, methane, and heat increment and digestible, metabolizable, and net energy as affected by the plane of nutrition.

From half maintenance to twice maintenance requirement the curve of digestible energy rose slowly at first because of increased digestion of crude fiber and then decreased at an increasing rate as the digestion of carbohydrates and protein lowered. The energy of feces curve was the reverse of that of digestible energy. The methane and urine energy curves fell in nearly straight lines with the increase in the plane of nutrition. The curve of total heat increment rose but at a decreased rate in each plane, while the net energy curve fell rapidly with each rise in plane of nutrition. The portion of total heat increment necessary for body increase was much higher than that needed for maintenance.

The net energy values of alfalfa hay for maintenance for the 2 steers were 1,385 and 1,395 Calories, for corn meal 3,111 and 3,059, and for the mixed ration 2,241 and 2,218 Calories per kilogram of dry matter. The net energy values of alfalfa hay at twice the maintenance requirement for body increase of the

2 steers were 634 and 605 Calories, for corn meal 2,494 and 2,477, and for the mixed ration 1.557 and 1,531 Calories. The net energy values at half more than maintenance were in close agreement with the above figures. The proportion of gross energy lost as methane and heat of fermentation were 7.92 and 12.13 per cent for the respective steers.

The author believes that the data indicate that comparable determinations of the specific dynamic effects of feeds, foods, or nutrients should be made at the same plane of nutrition.

Wintering breeding cows in Montana, L. VINKE (*Cattleman, 15 (1928), No. 6, pp. 30, 31*).—The results of a five-year study at the Montana Experiment Station showed that 88 cows receiving winter rations consisting of different combinations of corn fodder, corn silage, and straw made average winter gains of 51.5 lbs. per head and produced calves that averaged 372 lbs. at 163 days of age. On the other hand, 64 cows receiving these rations with the addition of alfalfa hay or cottonseed cake made average winter gains of 85.7 lbs. per head and produced calves weighing on the average 353 lbs. at 160 days of age. No advantage of high winter gains over low winter gains was reflected in the weight of the calves produced. Cows fed for high winter gains lost more weight during the summer than cows fed more limited rations. The author gives several rations that have proved successful for maintaining the weight of cows under severe winter conditions for from 90 to 120 days. It was also found that a brush creek bottom was superior to sheds on uplands as winter shelter for cows.

A test conducted during a prolonged winter when the supply of feed ran low and during the latter part of which the cows lost much weight indicated that while such conditions did not affect the birth weight of calves to any extent the normal growth of the calves was hindered due to the lack of sufficient feed for normal milk production of the cows.

Factors influencing percentage calf crop in range herds, G. H. HART and H. R. GUILBERT (*California Sta. Bul. 458 (1928), pp. 43, figs. 3*).—A review of the literature, together with data obtained in studies on range grass in California (E. S. R., 59, p. 762), is used as the basis for the information contained in this publication.

In all studies it has been found that the percentage calf crop is a most important factor in economical beef production. Infectious abortion has long been considered a factor in influencing the size of the calf crop, but evidence is presented in this study showing that failure to conceive is a more important factor with range cattle. A faulty plane of nutrition with cows resulted in a lack of proper functioning of the ovaries. together with no manifestations of the heat periods, while with bulls it often reduced breeding activity or fertility or both. A restricted mineral intake, particularly of calcium and phosphorus, has been shown to be associated with failure to conceive. Under range conditions a low mineral intake is associated with a low protein intake. Weather conditions vary the length of time the animals are on dry feed and to that extent influence the manifestation of deficiencies. Bone chewing and other evidences of depraved appetite are symptoms of nutritional deficiencies in advanced stages, but cattle may be on a deficient ration without showing these symptoms.

Bone meal and a protein concentrate are suggested as supplementary feeds for range cattle during prolonged periods on dry and sparse range. These supplementary feeds correct the deficiencies of poor range, namely minerals and proteins, and hence prevent to a large extent failure to conceive.

Fattening calves and yearlings, B. M. ANDERSON (*Cattleman, 15 (1928), No. 5, pp. 33–38, fig. 1*).—The value of adding ground limestone to the ration of fattening calves was studied at the Kansas Experiment Station. Two groups of 4 lots of 10 calves each averaging approximately 375 lbs. were fed for 180 days. Group 1 received dry roughage only, while group 2 received cane silage in addition. All lots received shelled corn and cottonseed meal. The first 2 lots in groups 1 and 2 received alfalfa hay and the last 2 lots in each group prairie hay. The second lot on each kind of hay in each group received ground limestone at the rate of approximately 0.11 lb. per head daily. The average daily gains were for group 1 2.46, 2.44, 2.15, and 2.25 lbs., and for group 2 2.32, 2.49, 2.07, and 2.43 lbs. per head, respectively.

This work showed that it was unnecessary to add ground limestone to a ration of corn, alfalfa hay, and cottonseed meal. The rate and cost of gain and the necessary selling price were practically the same in both alfalfa lots with and without this supplement. The addition to the ration containing prairie hay increased the daily gains 0.1 lb. per head and the selling price 25 cts. per hundredweight. When added to a ration of corn, alfalfa hay, cottonseed meal, and cane silage, the ground limestone increased the daily gains 0.17 lb. per head, decreased the cost of gain, and increased the margin per steer. In the rations in group 2, in which timothy hay replaced alfalfa the addition of ground limestone increased the daily gain 0.36 lb. per head, decreased the cost of gain, and increased the margin. The ground limestone was more effective in the rations containing silage than in the rations having dry roughage only. Further evidence of the value of silage and alfalfa hay was brought out in this study.

In an effort to determine the advisability of full feeding corn from the beginning of the period as compared with a limited ration for 90 days and then full feeding and also to determine the margin necessary to carry cattle from 150 to 225 days, 2 lots of yearling cattle averaging approximately 700 lbs. were fed. Cottonseed meal was fed at the rate of 1 lb. per head in both lots, and the animals were given as much alfalfa hay and cane silage as they would clean up. Lot 1 was full fed ground shelled corn, while lot 2 was limited to 5 lbs. of ground corn per head daily for 90 days and then full fed. The average daily gains for the 225 days were 2.13 and 2 lbs. per head in the respective lots.

It was found that the cost of gain increased 96 cts. per hundredweight from 150 to 225 days in lot 1 and only 39 cts. in lot 2, while the necessary selling price to break even increased 64 and 48 cts. per hundredweight in the respective lots. Up to 150 days lot 1 gained 0.33 lb. more per head daily than lot 2, but only 0.13 lb. more at the end of 225 days. The appraised selling price was 75 cts. per hundredweight more in lot 1 at the end of 150 days and 50 cts. more at the end of 225 days. Both methods of feeding proved satisfactory, the method to be used depending upon the cost and availability of corn and roughage.

Supplementing corn with cottonseed meal, B. M. Anderson (*Cattleman, 14 (1928), No. 9, pp. 33, 34*).—The value of cottonseed meal as a supplement to corn was studied at the Kansas Experiment Station. Three lots of 10 calves each averaging approximately 340 lbs. per head were fed for 231 days on a basal ration of shelled corn and cane silage full fed and alfalfa hay 2 lbs. per head daily. Lot 1 received no protein supplement, lot 2 1 lb. of cottonseed meal, and lot 3 2 lbs. of cottonseed meal per head daily. The consumption of feed was practically the same in all lots.

The average daily gains were 1.84, 2.06, and 2.12 lbs. per head daily. The amount of corn and cane silage required to produce 100 lbs. of gain decreased as the amount of cottonseed meal added to the ration increased. There was no great difference in the requirements of alfalfa hay, but lot 3 required nearly twice as much cottonseed meal as lot 2. The feed cost was lowest in lot 1 and highest in lot 3, while the selling price per hundredweight was highest in lot 3 and lowest in lot 1. The returns per steer, including hog gains, were highest in lot 2 and lowest in lot 3.

Method of docking and castrating lambs (*Pennsylvania Sta. Bul. 230 (1928), p. 16*).—Evidence points to the fact that the emasculator and hot docking pincers are the best means of docking lambs. Healing is more rapid with this method, and hence it interferes less with the ability of the lambs to gain.

Dipping of lambs, E. A. ELLIOTT (*Agr. Gaz. N. S. Wales, 39 (1928), No. 2, p. 106*).—In an effort to determine the effect of dipping upon the growth of lambs, experiments were conducted at the Bathurst Experiment Farm and the Hawkesbury Agricultural College, New South Wales. Three lambs were dipped in an arsenical powder dip, 3 in a carbolic dip, and 3 checks were undipped. All lambs were weighed the day the trial began, 5 days later, and 19 days later.

The average gain per head in the 3 lots from the first to the nineteenth day showed no significant difference. What differences did exist favored the dipped lambs. On the twenty-sixth day after dipping, the wool of dipped lambs was found to be slightly brighter than that of the check lot. The skin of all lambs was healthy.

Feed requirements of spring and fall pigs, A. E. TOMHAVE (*Delaware Sta. Bul. 156 (1928), pp. 11*).—In an effort to determine the feed requirements of fall pigs as compared with spring, a 3-year study was made with pigs farrowed at these seasons. The data collected cover the period from farrowing to the time the pigs reached 100 lbs. in weight. In almost every instance the fall pigs were farrowed by the same sows that had farrowed the spring pigs. The same system of management was followed in both spring and fall when the pigs were placed on rye pasture with their dams from 7 to 14 days of age. After weaning, spring pigs were run on rape or alfalfa pasture, while it was necessary to feed fall pigs in dry lot. The same grain ration was fed to the sows during each suckling period, and pigs also received identical rations when large enough to eat.

The average weight of fall-farrowed pigs was 0.14 lb. greater than that of spring pigs, due probably to the fact that during the gestation period the sows farrowing in the fall had access to green forage, while no forage was available for the spring farrowing sows even though they received alfalfa hay during the gestation period. Climatic conditions may also be an important factor in this difference. During the suckling period the sows lost an average of 3.22 lbs. per head in the spring and 20.85 lbs. in the fall.

Fall pigs required 36.99 lbs. more concentrates to produce 100 lbs. of gain than did the spring pigs during the farrowing to weaning period. During this period the average daily gain of fall pigs was 86 per cent of the gain made by spring pigs. From weaning to 100 lbs. of live weight, the average daily gain was 0.87 lb. per head for spring pigs and 0.63 lb. for fall pigs, and during this period fall pigs required 98.79 lbs. more feed per 100 lbs. of gain than did spring pigs. From farrowing to 100 lbs., spring pigs gained 0.72 lb and fall pigs 0.56 lb. per head per day and required 319.43 and 397.51 lbs. of feed, respectively, to make 100 lbs. of gain. The period following weaning when fall pigs were placed in dry lot proved to be a critical one, more animals becoming unthrifty at this time than in the case of spring pigs. The disadvantages in producing fall pigs were largely offset, however, by the advantages of reducing overhead feed costs and of distributing labor more evenly over the year.

[Swine feeding experiments at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 230* (*1928*), *p. 16*).—The results of two experiments are noted.

By-products for fattening swine.—During a 71-day feeding period 3 groups of 12 pigs each received the following rations: Lot 1 corn and tankage 12:1, lot 2 stale bread and tankage 12:1, and lot 3 moldy wheat and tankage 12:1. The average daily gains in the respective lots were 1.2, 0.87, and 1.39 lbs. per head. It required 434.5, 645.5, and 460.7 lbs. of feed to produce 100 lbs. of gain in the respective lots.

Fattening rations for swine.—In a comparison of rations for dry lot fattening, 6 lots of 12 pigs each were fed for 71 days as follows: Lot 1 shelled corn and tankage 12:1, lot 2 corn meal, ground oats, wheat middlings, and tankage 4:3:2:1, lot 3 shelled corn and pea-sized oil cake 10:1.7, lot 4 shelled corn, pea-sized oil cake, and tankage 10:0.6:1.1, lot 5 shelled corn, palmo midds, and tankage 7:7:1, and lot 6 shelled corn, rye middlings, and tankage 7:7:1. The average daily gains in the respective lots were 1.2, 1.23, 1, 1.38, 1.03, and 0.92 lbs. per head, and 434.5, 511.4, 574.5, 412.1, 746.9, and 700.8 lbs. of feed were required in the respective lots to produce 100 lbs. of gain.

Fattening the pig: Corn and protein supplement versus corn alone, P. G. BEDENBAUGH (*Mississippi Sta. Circ. 78* (*1928*), *pp. 4, fig. 1*).—Pigs averaging approximately 67 lbs. were divided into 2 lots of 3 head each and fed for 199 days. Lot 1 received corn and tankage on Bermuda grass pasture, while lot 2 received corn alone in dry lot. Lot 1 made an average daily gain of 1.55 lbs. per head and required 394 lbs. of corn and 17.3 lbs. of tankage to produce 100 lbs. of gain. Lot 2 gained an average of 0.58 lb. per head per day and required 692.5 lbs. of corn for each 100 lbs. of gain. The Bermuda grass was very tough during most of the period and the pigs did little grazing. Assuming that the grass furnished but small amounts of nutrients 100 lbs. of tankage in this test saved 1,722 lbs. of corn.

Soybean oil meal for fattening pigs, E. H. HOSTETLER (*North Carolina Sta. Bul. 259* (*1928*), *pp. 12, fig. 1*).—The series of studies at the Blackland Substation with soy bean oil meal as a protein supplement to corn for fattening hogs (E. S. R., 59, p. 767) has been continued and summarized.

It has been found that pigs consume more soy bean oil meal than is necessary to balance the ration when it is self-fed free choice with corn and minerals. When fed mixed in equal parts with fish meal, greater gains and profit were obtained than when it formed the sole protein supplement. Soy bean oil meal is quite palatable, and pigs consume it readily, but the cost of this feed should determine whether it be fed alone or in conjunction with some animal protein such as fish meal.

Swine production, W. ZORN (*Schweinezucht. Stuttgart: Eugen Ulmer, 1927, pp. IV+301, figs.* [*92*]).—A handbook for students, swine breeders, and swine raisers, dealing with the origin, development, and breeds of swine in Germany and the feeding, breeding, housing, and economics of swine production.

The principles and practice of horse-shoeing C. M. HOLMES (*Leeds, Eng.: Farriers' Jour. Pub. Co., 1928, pp. 251, figs. 77*).—A practical treatise designed for craftsmen, combining the knowledge of practical men with that of veterinarians. The work is divided into three main parts, namely, anatomy, practical work, and pathological shoeing, and appended is a short history of horse nail making.

The French bulldog ([*New York*]*: French Bulldog Club of Amer., 1926, pp. XIV+336, figs. 180*).—An interesting treatise on the origin of this dog, the history of its development in the United States, the standards used in various countries, and the characteristics of the breed.

[**Poultry experiments at the Pennsylvania Station**] (*Pennsylvania Sta. Bul. 230 (1928), pp. 7, 8. 36–39, figs. 3*).—Several experiments are noted.

Nutritional leg weakness in poultry.—R. J. Miller, R. A. Dutcher, and H. C. Knandel have found that the time of year at which chicks are hatched has a marked influence on the composition of the skeleton. Irradiating chicks by means of sunlight transmitted through Cel-O-Glass and Vitaglass and by means of a quartz mercury vapor lamp and blue flame carbon arc lamp produced results in growth response and skeletal development comparable to those obtained with Newfoundland and Norwegian cod-liver oils during the first eight weeks of life.

The inheritance of hatchability of eggs and livability of chicks.—Continuing this study (E. S. R., 58, p. 361), E. W. Callenbach found an increase in percentage of hatch of all eggs set of 12 33 over the results obtained in 1927 with White Leghorns. An increase of 7.74 per cent was obtained in 1928 with Barred Plymouth Rocks. The percentage of chicks dead or culled in the brooders by breeds was as follows: White Leghorns 9.55, Barred Plymouth Rocks 18.08, White Plymouth Rocks 15.44, Jersey Black Giants 26.04, Light Brahmas 17.67, Buff Orpingtons 7.57, and Rhode Island Reds 41.29. The high mortality of the last group was due to an epidemic of infection. Excluding this variety the mortality for 6,356 chicks under brooders was 12.96 per cent.

The effect of various protein-carbohydrate ratios upon the mortality, growth, and condition of Single Comb White Leghorn Chicks.—T. B. Charles, B. H. Margolf, Miller, and R. P. Tittsler fed chicks a ration containing 20 per cent protein for 14 weeks, at which time they averaged in weight 931.34 gm. per chick. Another group fed protein at a 17 per cent level weighed 878.51 gm., at a 14 per cent level 693.26 gm., at an 11 per cent level 278 gm., and at a 20 per cent level, with a gradual drop to 14 per cent, 842.86 gm. The rate of growth was materially decreased at the 14 per cent level and very slow growth and a high mortality occurred in the group fed 11 per cent protein. Chemical analyses showed no significant differences in the glycogen and fat content of the chicks in these groups, but during the thirteenth week the percentage liver tissue in the group receiving 11 per cent protein was higher than in the other groups.

Effect of different levels of animal protein, supplied by dried skim milk, on egg production, hatchability of eggs, and condition of Single Comb White Leghorn and Barred Plymouth Rock pullets.—In this study with skim milk, Knandel and Charles used 4 lots of 50 birds each of White Leghorn pullets and 4 similar lots of Barred Plymouth Rock pullets. Dried skim milk was added at the rate of 5, 10, 15, and 20 per cent to the basal ration in successive lots of each breed. For a period of 32 weeks the average production per bird in the White Leghorn lots was highest in the one receiving 10 per cent, followed in order by those receiving 15, 20, and 5 per cent of skim milk. During a 24-week period the Barred Plymouth Rocks receiving 15 per cent had the highest production, followed by the 10, 20, and 5 per cent skim milk lots. For the White Leghorns the percentage of hatch of all eggs set was 80.03 in the 15 per cent, 79.02 in the 10 per cent. 76.37 in the 5 per cent, and 75.61 in the 20 per cent groups. With the Barred Plymouth Rocks the 5 per cent group hatched 75.38 per cent of all eggs set, the 10 per cent 66.95, the 15 per cent 64.84, and the 20 per cent group 59.24 per cent. The percentage hatch of total eggs set was 77.78 for all White Leghorns and 66.14 for all Barred Plymouth Rocks.

Managing the pullet laying flocks in close confinement, W. C. Thompson (*New Jersey Stas. Hints to Poultrymen, 17 (1928), No. 1, pp. 4, figs. 2*).—The author outlines a very comprehensive plan for the feeding and management of pullets in close confinement.

Poultry in Kansas, compiled by S. J. Gilbert (*Kans. State Bd. Agr.* [*Quart.*] *Rpt., 45 (1927), No. 179, pp. 458, figs. 272*).—A rather exhaustive compilation of information for poultry producers.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 230 (1928), pp. 20–23, fig 1*).—The results of experiments, most of which are in continuation of work previously noted (E. S. R., 58, p. 363), are reported.

The effect of feeding heifers a ration deficient in vitamin A.—In this study by S. I. Bechdel, H. E. Honeywell, and R. A. Dutcher, the rations in the vitamin B work were used because they were quite deficient in vitamin A when cod-liver oil was omitted. Five heifers which were exposed to the rays of a carbon arc lamp for 15 minutes daily during the winter and to sunlight throughout the year when weather conditions permitted were observed in this test. After 6 to 7 months of feeding edema appeared in the legs of all animals. This condition gradually grew worse, accompanied by a decline in appetite. Swellings also became apparent about the neck and shoulders, and in some cases along the back, followed by an oily exudation on the legs and to a lesser extent in the other regions. Post-mortem examinations of 3 animals showed no evidence of bone disease or nerve deterioration. In all cases the tissues were infiltrated with a watery fluid in the region where edema existed. One heifer was completely blind and another had fitlike spasms occasionally. Feeding cod-liver oil for several weeks effected complete cures in 2 cases. Vitamin A deficiency caused 2 calves to be born prematurely, but no blindness was observed in either.

The relation of dairy type to milk production—Bechdel and P. S Williams have obtained ante-mortem and post-mortem data on 49 cows, which indicate that depth but not width of chest has a definite relation to weight of heart. The coefficients of correlation were 0.61 and 0.3, respectively.

The digestibility of the total ration as affected by grinding roughage.—Continuing this study, Bechdel and Williams found that cows spent on the average 27 per cent less time in regurgitating and ruminating when fed ground hay mixed with the grain than when it was unground and fed separately.

The deposition of minerals in the bones of calves fed rachitic and antirachitic rations.—Two calves that had been confined in a darkened stall continuously for 60 days by Bechdel, Dutcher, and H. H. Tucker and fed a rachitic ration of yellow corn, casein, corn gluten meal, and salt 64:8:24:1, made antirachitic by 15 minutes' exposure to the rays of a carbon arc lamp, showed a 5 per cent increase in ash deposition due to the ultra-violet light treatment of the feed.

The value of a mineral supplement in the dairy ration.—Dairy heifers that had been fed for 7 months by Bechdel and J. F. Shigley on bone meal in conjunction with either alfalfa or timothy hay maintained a better appearance than those fed the hays without the mineral. However, monthly measurements of height at withers have shown no evidence of differences in skeletal growth.

Getting the most from the dairy herd by better marketing, P. E. McNall and D. R. Mitchell (*Wisconsin Sta. Bul. 398 (1928), pp. 14, figs. 4*).—A popular publication discussing the advantages and disadvantages of selling milk on a butterfat, flat rate, or differential basis.

Significance of the chemical composition of the secreting and dry mammary gland to milk secretion, J. W. Gowen and E. R. Tobey (*Jour. Gen. Physiol., 12 (1928), No. 1, pp. 123–128*).—A joint study by the Rockefeller Institute for Medical Research and the Maine Experiment Station has shown that cows producing up to 30 lbs. of milk at one milking have the lactose equivalent of all this milk in the udder when milking begins. There was an average excess of 2.1 lbs. of lactose after subtracting the amount necessary for the contained milk. The udder of dry cows contained no lactose. An analysis showed that the blood leaving the udder through the mammary vein contained less dextrose than blood simultaneously drawn from the general circulation through the jugular vein of the milking cow. Based on this analysis, the authors concluded that the lactose of milk is derived from the dextrose of the blood.

The total composition of the functioning udder shows that there is a large excess of fat, ash, and nitrogen in proportion to that necessary for milk formation. The fat reserve of the dry udder is built up of fat that has a different Reichert-Meissl number from that of butterfat. The ash content is low, and the nitrogen content is similar to that of a secreting gland.

Preventing feed flavors and odors in milk, C. J. Babcock (*U. S. Dept. Agr. Leaflet 25 (1928), pp. 4, figs. 2*).—Some of the causes of feed flavors in milk and means of overcoming them are discussed in this publication.

Bacteria in freshly drawn milk, W. H. E. Reid (*N. Y. Prod. Rev. and Amer. Creamery, 66 (1928), No. 21, pp. 968, 970, 972*).—In conjunction with several cooperating agencies the Missouri Experiment Station makes a preliminary report on the effect of the bacterial count of the milk of individual cows on the bacterial count of the milk from the entire herd kept for the production of certified milk. The samples of milk were taken in sterile tubes as the milk was transferred from the milking pail to the cooling vat, iced immediately, and tested by standard bacterial methods as soon as possible.

The average bacterial count of the individual cows that exceeded 2,000 bacteria per cubic centimeter in every instance exceeded the average of the milk from the whole herd. It was estimated that the removal of such cows would have made it possible to produce milk with a bacterial count not exceeding 1,000 bacteria per cubic centimeter. Over a 10-month period seasonal changes had no apparent effect upon either the individual cow or the entire herd count. A study of the consistently high cows revealed nothing to which their high bacterial count could be attributed. Differences in breeds of cattle may be the influencing factor.

Cheese and butter making (*Ontario Dept. Agr. Bul. 336 (1928), pp. 70*).—A publication prepared by the staff of the dairy school, Ontario Agricultural College, giving directions for testing milk, cream, cheese, butter, and ice cream, and discussing in detail the methods of manufacturing butter, cheese, and ice cream.

Butterfat losses in buttermilk, W. B. Combs (*N. Y. Prod. Rev. and Amer. Creamery, 66 (1928), No. 3, pp. 138–141*).—The Minnesota Experiment Station analyzed 386 samples of buttermilk in an effort to determine what constitutes a low fat content, how efficiently cream is churned, and whether sweet-cream churning makes for greater or less loss of fat in the buttermilk than sour-cream churning. Of the samples, 321 were from sweet-cream churnings and 65 from sour-cream churnings. All samples were analyzed by the Mojonnier method as reported by Van Slyke (E. S. R., 58, p. 870).

The average fat content of all samples was 0.6812 per cent. Of the sweet-cream samples, 73.5 per cent had a fat content ranging from 0.5 to 0.9 per cent, while of the sour-cream samples 86.3 per cent had a fat content ranging from

0.5 to 1.1 per cent. The average fat content of the buttermilk from the sweet-cream churnings was 0.6403 per cent, and buttermilk from sour-cream churnings 0.791 per cent.

A number of trials showed that when buttermilk contained approximately 0.5 per cent of butterfat according to the normal butyl alcohol test, separation was not advisable, but when the volume was large and the fat content was 0.6 per cent separation was advisable. A year's data collected from churnings of sweet cream indicated that the average fat loss was 0.201 per cent when tested by the Babcock method and 0.5395 per cent when the normal butyl alcohol test was used. It was supposed that the softer fats present in butterfat in the spring months were more difficult to churn than were the harder fats normally present during the fall and winter months, thus accounting for seasonal variations in fat loss. Preliminary work has indicated that the time and temperature of chilling the fat previous to churning has an important influence on the losses of fat in the buttermilk.

Relation of specific gravity and Baume reading to solids content in plain condensed milk, F. J. Doan (*Ice Cream Rev., 12 (1928), No. 1, pp. 72–74, fig. 1*).—To obtain information regarding the relation of composition of plain condensed milk to density, this study was undertaken at the Pennsylvania Experiment Station. The determination of density was made by obtaining the specific gravity, using a pycnometer having a volume of about 120 cc., and later calculated to other scales when needed. The samples used were average factory skim milk, varying in fat content from 0.11 to 0.18 per cent. Weighings were made at 60, 120, 130, and 140° F., but comparisons were always made with water at 60° for determining specific gravity. The milk was condensed in a vacuum pan to approximately 40 per cent total solids, and additional samples down to 20 per cent total solids were obtained by diluting with distilled water.

The average specific gravity of normal skim milk solids at 60° was found to be 1.571. An equation has been devised by means of which the solids content of plain condensed skim milk at the above specific gravity may be calculated to within 0.9 per cent. The author produces a chart showing the relation between specific gravity and solids content, between gravity and Baumé readings, and between these three at 60, 120, and 140°, respectively.

[Experiments with dairy products at the Pennsylvania Station] (*Pennsylvania Sta. Bul. 230 (1928), pp. 23–25*).—The results of several experiments are noted.

Thermal efficiency of iceless ice cream shipping containers.—C. D. Dahle and F. J. Doan found that 13 iceless ice cream shipping containers, mostly of the canvas type, held ice cream in fair condition for approximately 6 hours at 80° F. When 3 to 3.5 lbs. of solid carbon dioxide was added to each container, the holding qualities were extended approximately 12 hours. When the containers were placed in the hardening room at 0° over night, the holding qualities were extended from 1 to 1½ hours.

A concentrated ice cream mix.—Ice cream mixes concentrated in vacuo by Dahle, J. D. Girard, B. F. Connell, and R. L. Paterson to double the normal solid content and with the gelatin omitted were stored for 6 months at 0 or 40° without increase in acidity. Excellent ice cream was made from that stored at 0°, but a very slight tallowy flavor was found in the ice cream made from mixes stored at 40°. Storing at room temperatures made the product unusable. Lactose crystals appeared in all the stored samples, but when the mix was processed the crystals disappeared. All the mixes froze normally.

Acidity of ice cream mixes.—Dahle and W. K. Budge found that the neutralizing value of an alkali varied, depending upon the composition of the mix, the acidity, and the amount of acid to be reduced. A mix with low acidity obtained over-run more quickly and had a better flavor and body than a high acid mix or a neutralized mix. Mixes neutralized with calcium alkalis were more viscous than unneutralized mixes, while mixes neutralized with sodium and magnesium alkalis were less viscous.

The danger point at which mixes coagulated was below pH 5.9, varying somewhat with the composition of the mix and with the rate of heating. Some mixes with a titrable acidity of 0.23 per cent coagulated on heating to 145° for 30 minutes.

Cream line formation.—Studies by Doan showed that the freezing point of the cream layer of bottled, held milk was in many cases lower than that of the milk in the under layer. This is attributed to the somewhat greater rate of acid development in the cream layer caused by the filtering effect of the fat in rising, thus creating a higher bacterial count in this layer.

Data obtained with the assistance of H. V. Green showed that artificially increasing the plasma solids of milk while the fat content remained constant tended to hinder the formation of the cream layer.

The homogenizing process.—In this study Doan and Green found that the following factors increase the clumping tendency: Increasing pressures and fat concentration, decreasing ratios between plasma solids and fat and temperatures of the plasma when the fat is in the liquid state, and medium temperatures of plasma when the fat is in the solid state. Factors that hinder clumping were high plasma solids and fat ratios, heating of the product, and any factor that lowered the efficiency of the homogenization.

The density of concentrated milk.—The relation of specific gravity of plain condensed skim milk to percentage of solids was studied by Doan, C. H. Minster, and I. E. Chenoweth at 60, 120, 130, and 140° F. It was found that each additional percentage increase in solids increased specific gravity by 0.0045 (0.516° Bé) at each of the temperatures. No temperature correction could be found for the entire range, but from 120 to 140° an approximate correction of 0.00032 in specific gravity or 0.041° Bé for each change of 1° in temperature was found.

Testing sweetened condensed and evaporated milk for butterfat.—In this study by W. D. Swope, Dahle, and Doan, it was found that testing with amyl alcohol increased the percentage of fat. Butyl alcohol used in conjunction with sulfuric acid seemed to give accurate results. Using 1 cc. of glycerine before adding sulfuric acid gave satisfactory results in all cases.

Effect of different homo pressures on mixes of varying fat content, W. H. E. Reid (*Ice Cream Trade Jour.*, *24* (*1928*), *No. 10*, *pp. 71*, *72*).—Continuing the study of processing ice cream mixes (E. S. R., 56, p. 570) at the Missouri Experiment Station, mixes containing 10, 12, 14, and 16 per cent of fat, with the milk solids-not-fat, sugar, and gelatin remaining constant at 10, 11, 13, and 0.5 per cent, respectively, were processed at different pressures. Five series of pressures were used, one series being with a single-stage homogenizer and the remaining series with a double-stage homogenizer, the second stage being kept at a constant pressure in each series while the pressure on the first stage varied. Overrun and temperature determinations were made every 30 seconds during the freezing process and immediately following the withdrawal of the first, third, fifth, seventh, and tenth gallons of ice cream.

It was found that homogenization decreased the size of the fat globules, thereby increasing the surface area, and emulsified the liquid, making separation impossible. It increased viscosity and surface tension, made possible a greater degree of incorporation of air, reduced freezing time, and gave a smoother body, closer texture, and a more desirable ice cream. The use of the two-stage homogenizer reduced the increase in viscosity between the initial and the highest viscosity for practically all series.

Controlling the temperature within the freezer was found to be the most effective manner of controlling overrun. The desired overrun and the brine shut-off point were obtained at temperatures which were characteristic for the composition of the mix. The best pressure for processing mixes containing 10 per cent of fat was found to be 3,500–2,000 lbs., and for mixes containing 12 per cent of fat 3,500–1,000 and 3,500–2,000 lbs. For the 14 and 16 per cent fat mixes the 2,000 and 1,000 lb. pressures, respectively, gave the best results.

Temperature of pasteurization: How it affects the mix properties, J. C. HENING (*Ice Cream Trade Jour., 24 (1928), No. 10, pp. 53, 54*).—The effect of the pasteurizing temperature on the properties of a standard ice cream mix was studied at the New York State Experiment Station. Mixes were pasteurized at 145, 155, and 165° F. for 30 minutes and at 180° for 10 minutes. The subsequent treatment for all mixes was identical. Viscosity determinations and fat globule and fat cluster measurements of these mixes were made.

It was found that with increased temperatures of pasteurization the viscosity and size of fat globule clumps decreased and the whipping qualities improved. The varying temperatures had no material effect upon the flavor, texture, and body of the subsequent ice cream with the exception of the 180° temperature, which was accompanied by a cooked flavor aftertaste.

Effect of homogenizing ice cream mixes before and after the addition of gelatin or sugar and before and after condensing, J. C. HENING (*Jour. Dairy Sci., 11 (1928), No. 4, pp. 299–312*).—This study at the New York State Experiment Station was undertaken to determine some of the variations which occur in the properties of ice cream mixes from unknown causes. The investigation dealt with the influence of adding gelatin or sugar to the mix before pasteurization and homogenization as compared with the addition after homogenization, and also the effect of homogenizing of the mix before and after condensing. The standard mixes were pasteurized either at 62 to 64° C. (144 to 147° F.) for 30 minutes or at 65° for 20 minutes. They were homogenized at the pasteurizing temperature and usually at 2,500 lbs. pressure, then cooled and held at from 3 to 5° for 15 to 20 hours before freezing. The viscosity of the mix and the size of the fat globules were determined, and each sample was scored for body, texture, and flavor.

It was found that adding gelatin before or after homogenization had little effect in altering the characteristics of the product, although the fat clumps were probably somewhat larger when gelatin was added before homogenization and the viscosity was slightly increased by adding the gelatin immediately after homogenization. The texture of the product was slightly improved when the gelatin was added after homogenization, but the hardness and melting resistance were not affected by the time of adding the gelatin. The extent of fat clumping, the viscosity, and the difficulty of obtaining overrun were increased by adding sugar prior to homogenization, but the quality and properties of the ice cream were not materially affected. Homogenizing with a two-stage valve decreased the size of the fat clusters, the viscosity, and allowed for an easier incorporation of air. The freezing process also reduced the size of the fat clusters, but the reduction was not uniform in all mixes. Homogenizing the mix before condensing reduced the size of the fat clusters, made it easier to whip the mix, and produced a finished product of somewhat better texture and quality than when the mix was homogenized after condensing.

The effect of hydrogen ion concentration on the bacterial content of gelatin, A. C. Fay (*Jour. Dairy Sci., 11 (1928), No. 4, pp. 313–324*).—The study of the sanitary qualities of gelatin has been continued at the Kansas Experiment Station (E. S. R., 59, p. 169). Samples of gelatin, 34 in all, were collected during 1927 from various producers and distributors. A 10 per cent solution of each was prepared aseptically, 10 cc. placed in each of four sterile tubes, and five drops of a 0.04 per cent aqueous solution of bromo-thymol blue added to each tube. Two of the tubes were inoculated with 0.1 cc. of a mixed microbial suspension estimated to introduce approximately 150,000 organisms, including yeasts, molds, and spore- and nonspore-bearing bacteria. The other two tubes were not inoculated. One tube of each pair had its reaction adjusted to pH 7, while the reaction of the original gelatin in the other tubes was not altered. All tubes were incubated for 21 days at 37° C., the number of days for growth to become evident recorded, and the pH value determined.

No relationship was found to exist between the reaction, which ranged from pH 4.8 to 6.6, and the bacterial count, ranging from 5 bacteria per gram to 20,000. The keeping quality test failed to check with the bacterial counts. Although a high acidity tended to retard the growth of the microorganism, in no case did it entirely inhibit the growth of the mixed population. The author points out that if gelatin has a low bacterial count it indicates that the product was produced under conditions that did not permit of excessive contamination, although the factors affecting bacterial destruction and growth, such as acidity, must be considered in fixing its sanitary qualities.

VETERINARY MEDICINE

Filterable viruses, edited by T. M. Rivers (*Baltimore: Williams & Wilkins Co., 1928, pp. IX+428, pls. 15, figs. 27*).—The several chapters deal with the subject as follows: Some General Aspects of Filterable Viruses, by T. M. Rivers (pp. 1–52); Filters and Filtration, by S. Mudd (pp. 53–94); Tissue Cultures in the Study of Viruses, by A. Carrel (pp. 95–109); Intracellular Pathology in Virus Diseases, by E. V. Cowdry (pp. 111–155); Virus Diseases of Man as Exemplified by Poliomyelitis, by H. L. Amoss (pp. 157–202); Virus Diseases of Mammals as Exemplified by Foot-and-Mouth Disease and Vesicular Stomatitis, by P. K. Olitsky (pp. 203–232); Virus Diseases of Fowls as Exemplified by Contagious Epithelioma (Fowl-Pox) of Chickens and Pigeons, by E. W. Goodpasture (pp. 233–275); Virus Diseases of Insects, by R. W. Glaser (pp. 277–331); Virus Diseases of Plants, by L. O. Kunkel (pp. 333–369); and Virus Diseases of Bacteria—Bacteriophagy, by J. J. Bronfenbrenner (pp. 371–418). Copious bibliographies are included.

Observations on rinderpest, R. Daubney (*Jour. Compar. Path. and Ther., 41 (1928, No. 3, pp. 228–248, figs. 4*).—It is concluded that neither formolized blood nor liver pulp possesses any antigenic value, although both are ordinarily infective in the fresh state. Formolized lymphatic gland tissue and formolized kidney pulp are both capable of conferring an immunity, but are apparently not equal in antigenic value to similar preparations of spleen.

Anti-rinderpest serum—preliminary field research in Uganda, J. Carmichael (*Jour. Compar. Path. and Ther., 41 (1928), No. 3, pp. 185–190*).—It was found that the titer of antirinderpest serum varies in proportion to the severity of the primary reaction of the serum producer. Animals which have passed through an attack of rinderpest were found to afford a simple and economical means of obtaining serum on the spot in the case of enzootic or epizootic areas. The dose for highly susceptible cattle in Uganda appears to be approximately 15 to 20 cc. per 100 lbs. body weight. Further work is said to be necessary to determine how long after recovery from rinderpest the serum of an animal is efficacious in doses of practicable size for double inoculation without hyperimmunization.

Surra in a pack of foxhounds, F. WARE (*Jour. Compar. Path. and Ther., 41 (1928). No. 3, pp. 249–254, figs. 3*).—This is an account of a most disastrous epidemic of surra, which obliterated a pack of foxhounds in Bombay.

Experiments relating to the pathology and the etiology of Mexican typhus (tabardillo), I, II, H. MOOSER (*Jour. Infect. Diseases, 43 (1928), No. 3, pp. 241–272, figs. 7*).—The first part (pp. 241–260) deals with the clinical course and pathologic anatomy of tabardillo in guinea pigs, and the second part (pp. 261–272) with diplobacillus from the proliferated tunica vaginalis of guinea pigs reacting to Mexican typhus. The author has demonstrated a minute intracellular diplobacillus in sections and smears of the proliferated tunica vaginalis of guinea pigs reacting to the virus of tabardillo. Considerable evidence is presented to show that this diplobacillus is the causative agent.

Researches on bacillus-Calmette-Guerin and experimental vaccination against bovine tuberculosis, E. A. WATSON (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 7, pp. 799–816*).—This is a report of investigations conducted in collaboration with C. W. McIntosh and H. Konst, of the Canada Department of Agriculture. The results obtained in experiments conducted have led the authors to feel fully warranted in concluding that B. C. G. vaccination is still in the experimental stage and in respect to its innocuity and efficiency open to question, notwithstanding the favorable reports obtained from Europe and the French colonies.

Statements on tuberculosis questioned, M. P. RAVENEL (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 7, pp. 877, 878*).—The author calls attention to the fact that there is no satisfactory evidence of avian tuberculosis appearing in man.

Rabbit fever or tularemia, W. C. BARNES (*Sci. Mo., 27 (1928), No. 5, pp. 463–469, fig. 1*).—A practical review of the status of knowledge of this disease in man contracted from infected rabbits.

Observations on the pathology of Bacterium abortus infections, E. T. HALLMAN, L. B. SHOLL, and A. L. DELEZ (*Michigan Sta. Tech. Bul. 93 (1928), pp. 19, pls. 17*).—In this report of studies on the pathology of *B. abortus* infections the authors deal with lesions in experimentally infected guinea pigs, of fetal membranes of the cow, in the udder, and in the aborted calf.

In work with guinea pigs, 4 strains of the organism obtained from swine, 10 strains from humans, and 6 strains from cattle were used. The fundamental tissue reaction in the guinea pig was found to be the same with all strains used. There was considerable variation in the ability of the different strains to produce extensive lesions. The primary lesion was found to consist to a variable degree of endothelial cells, small round cells, and fibroblasts. Necrosis of the primary lesions may or may not occur, and if necrosis occurs, abscessation may or may not occur. The incidence of necrosis and abscessation in the various organs of the pigs used is reported in tabular form. The focal lesions in the epididymis and testicle appear to have a marked inhibitive effect on spermatogenesis.

"Extensive studies of the fetal membranes of *B. abortus* infected cows indicate that necrotic placentitis and necrotic chorionitis are the predominating lesions of the fetal membranes in such cows. These studies indicate that, fundamentally, necrosis of the chorion is essentially the same process as is necrosis of the placenta. There are sufficient reasons to justify the assumption that the lesions of the fetal membranes are duplicated in the endometrium.

Data are cited that indicate that extensive necrosis of the placenta, per se, has no influence on the development of placental areas during subsequent pregnancies. Extensive chorionitis appears to be of greater importance in making a prognosis as to future breeding efficiency than is extensive placentitis. The fetal membranes of subsequent pregnancies in animals that show chorionitis and placentitis may show no indication of previous disease. Fetal pneumonia is a frequent condition in aborted calves." Broncho-pneumonia is the predominating type in the cases that have come under the authors' observation. The data are said to be insufficient to indicate whether there is or is not any relation between fetal infection and calf pneumonia.

"Histological studies of the udder in 15 cases indicate that *B. abortus* infection in the udder is associated with pathological lesions. The predominating condition in such udders is a subacute or chronic interstitial mastitis. Degeneration and desquamation of the parenchyma and cell exudation into the acini of the gland may be seen to a variable degree, depending upon the acuteness of the process"

A list of 17 references to the literature is included.

Treatment of cattle infected by T. congolense with antimony potassium tartrate, U. F. Richardson (*Jour. Compar. Path. and Ther., 41 (1928), No. 3, pp. 199–208*).—The author reports upon the use of antimony potassium tartrate in outbreaks of trypanosomiasis due to *Trypanosoma congolense*, which successfully prevented further spread of the disease from the infected herds to neighboring stock. The treatment led to the recovery of the great majority of infected animals. Although a few infected animals remained, no further spread of disease occurred in the herds concerned.

Studies in lamb dysentery, W. A. Pool, H. Preston, and A Brownlee (*Jour. Compar. Path. and Ther., 41 (1928), No. 3, pp. 173–184*).—Attempts made by the authors through transmission experiments to demonstrate the presence of an infective agent in the uterus of ewes whose lambs had died from dysentery gave negative results. Negative results were also obtained in attempts to infect lambs before birth by drenching pregnant ewes with feces and intestinal ulcers derived from natural cases of the disease. Similar results were obtained in attempts to infect newborn lambs with dysentery by soiling the umbilicus with feces from a natural case of the disease, but it was found that the disease can be definitely produced in newborn lambs by ingestion of feces from natural cases of the disease.

The transference of immunity from ewe to lamb, T. Dalling, J. H. Mason, and W. S. Gordon (*Roy. Soc. Med. [London], Proc., 21 (1928), No. 9, pp. 1579, 1580*).—In the course of investigational work with lamb dysentery the authors devised a method of protecting lambs from the affection by the inoculation of the mother sheep with a toxin-antitoxin mixture, prepared from the toxin of an anaerobe isolated from lesions in naturally infected lambs. The field results show lambs to be protected by this method. Thus, in 1926, 2.34 per cent of the lambs born from inoculated ewes died from lamb dysentery, while 18.44 per cent of the lambs from uninoculated ewes died. In 1927, 0.87 per cent of lambs from inoculated ewes died, while 8.04 per cent of lambs from uninoculated ewes developed lamb dysentery.

Two cases of tuberculosis in sheep, W. Jowett (*Jour. Compar. Path. and Ther., 41 (1928), No. 3, pp. 255–258*).—Descriptions are given of two cases of natural tuberculosis in sheep in both of which the lesions were of the retrogressive type, but much less extensive in one case than in the other. In both sheep the cultures obtained were of the bovine type, both in cultural characteristics and in virulence for the test animals utilized. In both cases the disease appeared to have been of alimentary origin.

Carbon tetrachloride in liver rot of sheep: The stage at which the fluke is assailable by the drug, and the bearing thereon of dosage, R. F. MONTGOMERIE (*Jour. Compar. Path. and Ther., 41 (1928), No 3, pp. 191–198*).—It is pointed out that since the administration of carbon tetrachloride in doses of 5 cc. appears to destroy the fluke relatively soon after it gains entrance to the animal's body and, 5 cc. being the contents of a single suitable capsule, is inexpensive, its periodic administration is apparently the most advantageous means of controlling the disease. Sheep infested with parasites too immature to be killed by the dose commenced to pass ova as early as two weeks after dosage with 1 cc. of the drug, but not until at least four weeks had elapsed when 10 cc. was administered.

Use of kamala in tapeworm infestations of sheep, T. O. BRANDENBERG (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 7, pp. 871–873*).—It is pointed out that of all the intestinal parasites the broad tapeworm, *Moniezia expansa* (*Taenia expansa*) or *M. alba* (*T. alba*), has been the cause of most loss and apparently the hardest to control. In experimental work with teniacides commenced in the late summer of 1927, powdered kamala and copper sulfate have been found the most effective. A combination of the two is said to be the most valuable teniacide in large bands of sheep because of its great efficiency, ease of administration when in capsule, and its small cost.

Serological studies in the control of hog lungworms, G. ZEBROWSKI (*Penn. Acad. Sci. Proc., 1 (1924–1926), pp. 62, 63*).—The author reports upon studies conducted with different extracts of two species of hog lungworms, *Metastrongylus apri* and *M. brevivaginatus*, which indicate that specific antibodies can be built up in the host against proteins of these worms. The studies are being continued to determine whether a practical method of immunization can be devised.

The occurrence of the swine kidney worm (Stephanurus dentatus) in the urinary bladder and ureters of the host animal, E. M. NIGHBERT (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 7, pp. 874, 875*).—The author finds that the kidney worm, as well as its eggs, can and sometimes does leave its natural location in the kidneys and kidney fat of the host animal and pass out through the urinary tract.

Further contributions to the knowledge of infectious cerebrospinal meningitis (Borna disease) of the horse [trans. title], W. ZWICK (In *Festschr. Eugen Fröhner zu seinem 70. Geburtstage. Stuttgart: Ferdinand Enke, 1928, pp. 407–433*).—The first part (pp. 407–415) of this account is devoted to a discussion of the relation of enzootic encephalitis of the horse of Moussu and Marchand (E. S. R., 51, p. 384) to the infectious cerebrospinal paralysis of Fröhner and Dobberstein. The second part (pp. 415–432) deals with the histopathology, diagnosis, immunity, and therapeutics of Borna disease.

The author concludes that Borna disease of the horse is not identical with the affection studied by Moussu and Marchand, but is identical with enzootic encephalomyelitis of the sheep. It was found possible through the subcutaneous injection of an emulsion made from the brain of affected rabbits to immunize the horse and sheep actively against the natural disease.

Immunization experiments with contagious pleuropneumonia of the horse [trans. title], LÜHRS (In *Festschr. Eugen Fröhner zu seinem 70. Geburtstage. Stuttgart: Ferdinand Enke, 1928, pp. 184–225*).—This report of work conducted is presented in connection with a list of 193 references to the literature.

Gastro-intestinal parasites of equines and control measures, B. SCHWARTZ (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 7, pp. 855–870*).—This is a practical review of the status of knowledge of the subject.

[Poultry disease studies at the Pennsylvania Station] R. P. Tittsler (*Pennsylvania Sta. Bul. 230 (1928), pp. 25, 26*).—In the bacillary white diarrhea work (E. S. R., 58, p. 370) the author reports having continued the study of hydrogen sulfide production by *Salmonella pullorum*, more than 200 strains having been tested. It was found that an incubation temperature of 25 to 30° C. was most favorable, and that 43° was almost completely inhibitory. It was also found that all strains did not behave alike quantitatively. Many of the strains were negative at 37° but were decidedly positive at 25 to 30°. All gave much stronger and quicker results at 25 to 30° than at 37°. Two hundred of the strains reduced nitrates regularly. Difco peptone 1 gm., potassium nitrate 0.2 gm., and distilled water 1 liter was used as a medium, greater concentrations of either peptone or potassium nitrate being not only unnecessary but undesirable. Similar results were obtained with the sulfanilic acid alpha-naphthylamine and sulfanilic acid dimethyl-alpha-naphthylamine methods of testing for nitrites. Extreme variations in morphology were obtained by the use of certain salts in the medium, the size changing from 1.2 μ on the medium without added salts to 8 to 10 μ in the presence of either 3 per cent sodium or potassium chloride, and to 0.85 μ in the presence of 3 per cent magnesium chloride.

The agglutination studies previously reported were repeated and the results confirmed, it being evident that an antigen prepared from several strains will detect more reactors than a single-strain antigen.

A study of the lungs of diseased chicks showed that they are affected in the majority of cases, being either congested or filled with cheesy nodules. *S. pullorum* was isolated from the lung tissue. The author is of the opinion that germs are expelled in the breath of the diseased chick, presenting a means of spread in both the incubator and the brooder which has not received sufficient consideration (E. S. R., 58, p. 880).

Poultry autopsies were made of approximately 500 birds from 210 farms, of which 325 were chicks under 1 month of age. Bacillary white diarrhea was found in 90; paralysis in 30; coccidiosis in 25; roup, pneumonia, and pox in 20; tapeworm and roundworm in 15; oviduct ailments in 8; blackhead in 5; cholera in 3; and tumors in 2.

American studies on the cause of bacillary white diarrhea of chicks and work with the agglutination test [trans. title], O. Bederke (In *Festschr. Eugen Fröhner zu seinem 70. Geburtstage. Stuttgart: Ferdinand Enke, 1928, pp. 26–41, fig. 1*).—This is a discussion of work with this disease and its diagnosis in the United States, presented in connection with a list of 41 references to the literature.

The accuracy of the agglutination test in the diagnosis of bacillary white diarrhea, P. R. Edwards and F. E. Hull (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 7, pp. 839–843*).—In this contribution from the Kansas Experiment Station the authors report upon comparative agglutination tests made by laboratories in eight States. The results of tests of the 24 samples of the same sera made by each of the laboratories, reported in tabular form, are quite uniform, or 96.1 per cent in agreement. It is pointed out that the discrepancies which appeared in the comparative tests were largely due to the effect of the preservative (thymol) upon the agglutinins. The authors consider the results to demonstrate that the agglutination test for the detection of bacillary white diarrhea is an accurate method of diagnosis.

A medium for the isolation of Salmonella pullorum and other members of the paratyphoid group from avian tissues, W. L. Mallmann, F. Thorp, jr., and M. Semmes (*Jour. Amer. Vet. Med. Assoc., 73 (1928), No. 7, pp. 825–838, figs. 6*).—In work at the Michigan Experiment Station the authors found that brilliant green, when added to nutrient agar, allowed unrestricted growth of

S. pullorum, *S. gallinarum*, and all other members of the paratyphoid group. It had a selective inhibitory effect upon *Escherichia coli*, and inhibited the growth of Gram-positive organisms found as contaminants in the usual autopsy plates. A brilliant-green liver-infusion agar is recommended for the isolation of *S. pullorum* and allied organisms from tissues of autopsied chickens, particularly baby chicks. Brilliant green was the only dye of those tested that exhibited selective bacteriostatic action among the colon-typhoid intermediates. The bacteriostatic effect of brilliant green obtained from various manufacturers gave decided variations. Stock solutions deteriorated, upon aging, in their bacteriostatic effect, and fresh solution or one not more than four weeks old should be used.

Infectious purulent entero-proventriculitis of fowls, B. F. Kaupp, R. S Dearstyne, et al. (*North Carolina Sta. Tech. Bul. 31 (1928), pp. 66, figs. 6*).—The authors here describe a disease of the domestic fowl due to a filtrable virus which does not appear to have been previously recognized. The outstanding clinical symptoms of the disease are said to consist of pruritis, nervous affections as twitching of the head to complete paralysis, swelling of the facial parts, acute diarrhea which may be either watery or of a purulent yellow nature, periodic spells of depression, and a general unkempt appearance. The respiration, except in unusual cases, is not affected and there are periodic spells of elevation of temperature.

"The gross anatomy consistently shows a purulent, enteroglandulitis. The walls of the intestine may be pasted with an offensive purulent deposit. There may be internal abscesses at sites other than the proventriculus. The glandular organs may or may not be affected.

"The disease was readily reproduced in two instances by cohabitation with actual cases. It was reproduced in one instance by infecting the drinking water of a negative bird with the defecations from an actual case and in five instances by the introduction of the Berkefeld filtrate from emulsions of infected areas of birds dying from the disease. One of the artificially infected birds died. All of them produced pathological degenerations which parallel those of the original cases both macroscopically and microscopically. The clinical symptoms and blood relations are approximated in the actual cases studied and in the artificially infected cases.

"The blood studies are indicative of the rise and fall of body resistance against a chronic infection. The disease apparently does not effect the reproductive powers of the birds except at the final stages. The incubation period under natural conditions is probably about 14 days. Artificially infected birds may come down within 48 hours. The disease is probably highly contagious but mildly virulent.

"Inasmuch as there appears no scientific record of such a disease in the domestic fowl, it is suggested that it be designated as infectious purulent entero-proventriculitis of fowls."

On Rous, leucotic, and allied tumours in the fowl, J. P. McGowan (*New York: Macmillan Co., 1928, pp. VII+99, pls. 11*).—This work deals with blood cell origins and nomenclature, observations on Rous tumors No. 1, intravital staining of Rous tumor No. 1, spontaneous tumors of Rous type, leucotic tumors in fowls, melanomata in fowls, the rôle of the lymphocyte in avian pathology, and the etiology of tumors.

AGRICULTURAL ENGINEERING

Water-finder work in the Bombay Presidency, D. L. Sahasrabuddhe (*Bombay Dept. Agr. Bul. 152 (1928), pp. 47, pl. 1*).—An instrument for the location of underground water supplies, using the principle of the magnetic needle, is described, and the results of actual tests are reported. The latter showed "that in a country where at least 40 per cent of wells under normal circumstances are failures even in selected sites, wherever the automatic water finder has indicated water, and a careful test, including boring, has been made, water has been found. As a rule the supply indicated has been within the depth of well sinking; in a few cases subartesian water has been found by boring at varying depths up to 126 ft. . . .

"It would seem, therefore, sufficiently proved that under the conditions which prevail in the trap areas of western India where underground water occurs in well-defined streams flowing in rock fissures, sometimes under little or no pressure and sometimes under considerable pressure, the water finder can be used with advantage in locating streams of water which can be tapped either by well digging or by boring."

Surface and subsurface waters of the Yakima and Klamath reclamation projects, C. C. Wright (*Washington Col. Sta. Bul. 228 (1928), pp. 45*).—The results of a study conducted in cooperation with the U. S. D. A. Bureau of Plant Industry are reported.

It was found that in the great majority of cases neither the drainage water nor the ground water from this region contained appreciably large quantities of dissolved salts, but that in every case where the soil of alkali areas was sampled it contained large quantities of soluble salts, especially in its surface layers. The drainage and underground water from normal productive land was found to be equally as salty as that which came from distinctly alkali areas, if not more so. The soil solution was found to vary widely in concentration in the alkali areas. These results are taken to indicate that at least a part of the drainage and underground water, especially in alkali areas, comes from sources other than through the upper layers of the soil.

Surface water supply of the United States, 1924, Parts 1, 10 (*U. S. Geol. Survey, Water-Supply Papers 581 (1928), pp. VI+246, fig. 1; 590 (1928), pp. V+131, fig. 1*).—Part 1 of this report, prepared in cooperation with the States of Maine, New Hampshire, Massachusetts, New York, and New Jersey, presents the results of measurements of flow made on streams in the North Atlantic slope drainage basins during the year ended September 30, 1924. Part 10, prepared in cooperation with the States of Utah, Nevada, California, Oregon, Idaho, and Wyoming, presents the results of corresponding measurements made on streams in the Great Basin.

Constructional steelwork simply explained, O. Faber (*London: Oxford Univ. Press, Humphrey Milford, 1927, pp. 120, figs. 54*).—This handbook contains chapters on elementary properties of steel, factor of safety, problems of elasticity, bending moments, resisting moments, shear and web stresses, stanchions, riveted and bolted connections, bases and grillages, and new British standard sections.

The philosophy of masonry arches, E. O. Williams (*Inst. Civ. Engin. [London], Select. Engin. Papers, No. 56 (1927), pp. 34, figs. 6*).—A discussion.

A study of the failure of concrete under combined compressive stresses, F. E. Richart, A. Brandtzaeg, and R. L. Brown (*Ill. Univ., Engin. Expt. Sta. Bul. 185 (1928), pp. 104, figs. 36*).—Tests of mortar and concrete covering the usual range of mixtures showed that in general the strength of the material in biaxial compression was as great as in simple compression, and that in many cases it was greater. The strength of the concrete in triaxial compression was found to increase greatly with the magnitude of the smallest principal stress. The tests of concrete of lean, medium, and rich mixtures in triaxial compression showed that the rate of increase in the strength with increase in the smallest principal stress was largely independent of the proportions of the concrete mixture. The triaxial compression tests showed that the presence of lateral pressures added to the strength of the specimen an amount approximately 4.1 times the magnitude of the lateral pressure.

The high stresses resisted by the concrete in triaxial compression were always accompanied by very large deformations. The axial deformation at maximum load ranged from 0.5 to more than 7 per cent of the length of the specimen, depending on the magnitude of the stress and the quality of the concrete. Much of the deformation under triaxial loading was due to an inelastic reduction in volume, or a compacting, of the concrete under stress. The amount of compacting varied considerably with the richness of the mixture.

The tests of concrete in simple compression showed characteristic differences in behavior throughout three distinct stages of loading. In the first stage the action was nearly elastic; in the second stage an appreciable part of the deformation was inelastic, and the action was marked by an increase in the rate of deformation and in the ratio of lateral to longitudinal deformation; in the third stage, which began at loads 75 to 85 per cent of the maximum load, a general breakdown of the internal continuity of the material developed. In this stage there was a very great increase in the lateral deformation, which finally produced an increase in volume under continued loading, indicating by this lateral bulging that a splitting failure was taking place throughout the material on surfaces parallel to the direction of the applied compressive stress. The tests in biaxial and triaxial compression also indicated that a process of splitting similar to that found in simple compression was prominent in the failure of the material under these combined stresses.

The electrical resistance of wood as a measure of its moisture content, A. J. Stamm (*Indus. and Engin. Chem., 19 (1927), No. 9, pp. 1021–1025, figs. 2*).—Studies conducted by the U. S. D. A. Forest Service are reported, the results of which show that the determination of the electrical resistance of wood as a means of measuring its average moisture content using surface electrodes is practical only within narrow limits. For stock in which the moisture content is below the fiber saturation point and approaching an equilibrium condition and which does not have an appreciable surface film of condensed moisture tending to short-circuit the electrodes, the average moisture content can be determined by the resistance method to an accuracy of about 1 per cent absolute moisture content.

While the use of this method seems limited, the results suggest that the method can be used for determining center moisture content of stock, over a thickness range sufficiently small that the moisture gradient effect will be small, by using side-insulated point or knife-blade electrodes which can be pressed into the interior of the wood.

A principle for testing the durability of paints as protective coatings for wood, F. L. Browne (*Indus. and Engin. Chem., 19 (1927), No. 9, pp. 982–985, figs. 3*).—In a contribution from the U. S. D. A. Forest Service the basic principle is set forth of a technique for measuring the degree of protection afforded by paint coatings against the weathering of wood and the change in their protective power as the coatings themselves deteriorate during exposure.

It was found that the durability of paints as protective coatings can be measured by observing their effectiveness in retarding the absorption of moisture from saturated air by painted wood panels at intervals during the exposure of the panels to the weather. Paints of different composition may have very different life histories with respect to moisture-excluding effectiveness, and neither the time of initial chalking nor of initial exposure of wood through coating disintegration can be relied upon as a general indication of the durability of the effectiveness of the coating. During the early part of the life history of an initially adequate protective coating the amount of moisture absorbed by coated wood panels is a characteristic of the coating rather than of the wood; that is, the absorption is about the same regardless of the kind of wood coated. During the latter part of the life history of the coating the influence of the wood becomes noticeable. In test-fence results indications of the deterioration in moisture-excluding effectiveness of the coatings were given by the obvious beginning of wood weathering under coatings that still remained intact.

Protecting wood with aluminum paint, J. D. Edwards and R. I. Wray (*Indus. and Engin. Chem., 19 (1927), No. 9, pp. 975–977*).—Data are reported to show that paint coatings continue to protect wood adequately against weathering only so long as they maintain a reasonable degree of moisture-excluding efficiency.

It is further shown that coatings having a moisture-excluding efficiency still higher than the traditional house paints afford materially greater protection against wood weathering. Aluminum paints or coatings made up of a priming coat of aluminum paint covered by ordinary house paints are highly impermeable to moisture, are especially effective in preventing wood weathering, and are very durable.

The correct explanation for the heaving of soils, plants, and pavements, G. J. Bouyoucos and M. M. McCool (*Jour. Amer. Soc. Agron., 20 (1928), No. 5, pp. 480–491, figs. 7*).—Studies conducted at the Michigan Experiment Station are reported which indicate that the heaving of soils, plants, and pavements is caused almost entirely by the drawing or accumulation of water on freezing at or near the surface by the force of crystallization. "This frozen water grows upward in the form of massive capillary ice columns, pillars, ridges, or solid sheets of ice. As water is pulled or drawn to the points of freezing and as these different forms of ice grow upward, they push upward. This is a general fundamental principle and, in one modification or another, underlies nearly all the phenomena of heaving of soils, plants, and pavements."

Public Roads [October, 1928] (*U. S. Dept. Agr., Public Roads, 9 (1928), No. 8, pp. 153–168+[2], figs. 28*).—This number of this periodical contains the status of Federal-aid highway construction as of September 30, 1928, together with the following articles: Landslides and Their Relation to Highways, Part 2, by G. E. Ladd (E. S. R., 57, p. 186); and The Modulus of Elasticity of Cores from Concrete Roads, by A. N. Johnson.

The influence of various factors on the power and economy of a gasoline engine, E. A. Allcut (*Engin. Jour., 11 (1928), No. 11, pp. 549–559, figs. 13*).—In a contribution from the University of Toronto, a large amount of data from tests bearing on the subject are reported and discussed.

One of the first conclusions drawn is that there is no economic advantage in buying antiknock fuels at a 3-ct. premium if an engine having a compression ratio of 5.5:1 can be operated satisfactorily on an ordinary gasoline. The data also indicated that the cooling water temperature has no appreciable effect on the brake horsepower or on the brake thermal efficiency.

It was also found that there is no gain in power or economy by using special lubricants in fuels, although there may possibly be some beneficial results so far as the running surfaces are concerned.

Quantitative antiknock testing, C. K. Reiman (*Indus. and Engin. Chem., 19 (1927), No. 9, pp. 1055–1058, fig. 1*).—A method of measuring the antiknock quality of motor fuels is explained in detail. Provided there is but little difference in antiknock value between the unknown sample and the known aniline standards used in the final comparison, it is shown that the same result is obtained whether the comparison is made at high or low speed, high or low compression, high or low power output, with heavy or light knocking, rich or lean mixture, and regardless of the timing of the spark. Quantitative results on a series of fuels are included.

Torque dynamometer for tractor drivewheels, E. G. McKibben (*Agr. Engin., 9 (1928), No. 10, pp. 311, 312, figs. 4*).—In a contribution from the California Experiment Station a torque dynamometer for tractor drivewheels is described and the theory of its use explained.

Plows and good plowing, C. O. Reed and E. A. Silver (*Ohio Agr. Col. Ext. Bul. 80 (1928), pp. 61, figs. 34*).—This bulletin presents practical hints relating to the important adjustments of plows and to good plowing practice in Ohio, with particular reference to the control of the corn borer.

[Labor-saving machinery needed in potato growing], H. B. Josephson (*Pennsylvania Sta. Bul. 230 (1928), p. 27, fig. 1*).—It is reported that a real need has been developed for labor-saving machinery in potato growing, particularly in harvesting, where the labor was found to be from 42 to 54 per cent of the entire labor requirements of the crop. Picking, which is entirely a hand operation, consumed from 26 to 33 per cent of the total labor of producing the crop.

Combining unevenly ripened wheat, H. E. Murdock and M. L. Wilson (*Mont. Agr. Col. Ext. [Pub.] 92 (1928), pp. 15, figs. 16*).—Practical information on the subject is presented, it being pointed out that wheat growers on large acreages should use the combine method of harvesting but should use either the windrow method or the header barge method to insure against loss.

A drying house for the rapid handling of forage samples, T. E. Odland and R. J. Garber (*Jour. Amer. Soc. Agron., 20 (1928), No. 5, pp. 477–479, fig 1*).—This structure is described in a contribution from the West Virginia Experiment Station.

The control of heat and ventilation in sweet potato storage houses, S. P. Lyle (*Agr. Engin., 9 (1928), No. 10, pp. 309–311, figs 3*).—Studies conducted at the Georgia State College of Agriculture on the positive control of temperature and humidity within the optimum range in natural draft houses are reported. With the factors of insulation, ventilation area, and grate size fixed, the performances of six combinations of storage house features were investigated, including (1) flat ceiling, heated intake, stove below floor, distributed heat, King type vents; (2) flat ceiling, heated intake, stove below floor, central heat, King type vents; (3) flat ceiling, part of intake heated, stove above floor, Rutherford type vents; (4) standard type check—sloping ceiling, part of intake heated, stove above floor, Rutherford type vents; (5) sloping ceiling, part of intake heated, stove above floor, King type vents; and (6) a proposed improvement in design—sloping ceiling, heated intake, stove below floor, distributed heat, Rutherford type vents.

The preliminary results showed that shortening of draft ducts to the minimum, thus reducing friction, gives most effective evaporation. The admission of large amounts of unheated air is highly effective in causing evaporation. These two conditions are conducive to the highest fuel economy. Sloping ceilings, increasing the effective height above the top layer of crates and tending to streamline the exhaust currents to vents in the ridge, are more conducive to uniform temperatures than a flat ceiling under the above conditions, but both give poor results in this respect. The most uniform temperatures are obtained with distributed heat; in these tests the distribution was made through a hot air-pipe system. Uniformity of temperature characteristics is accompanied by uniform relative humidity.

"The dynamic forces in the natural draft system of ventilation are so slight that their effective utilization requires a nicety of balance in the various factors of house design, as may be noted in some data presented herewith. Hence, we believe it expedient if not essential to approximate a good ventilation performance before accepting the results of draft, fuel, and other measurements as reliable for designing purposes. In other words, the interrelation of certain factors is such that reliable data can not be obtained through isolated studies of these factors."

Heating and ventilation, H. RIETSCHEL and C. W. BRABBÉE, trans. by C. W. BRABBÉE (*New York and London: McGraw-Hill Book Co., 1927, pp. XI+332, figs. 188*).—This is the first English edition of this book, which has been translated from the seventh German edition. It contains parts on heating, ventilation, the design of heating systems, and ventilation systems, together with a large amount of tabular working data.

Design and performance of domestic oil burners, W. C. McTARNAHAN (*Sanit. and Heating Engin., 107 (1928), No. 9, pp. 725–730*).—A brief résumé is given of the design and operation characteristics of oil burners now in general use which are considered to be successful by the author.

Recommendations for electric water heating (*Elect. World, 92 (1928), No. 21, pp. 1039–1041*).—The results of a 2-year study of American and European practices in electric water heating are summarized, indicating the value of low-wattage, high-storage capacity domestic water heaters. The tests also demonstrated that water heating can never be expected in volume on rates above 2 cts., with the exception of intermittent water heating. Water heating which will cost more than 6 mills per gallon to operate is not recommended.

Power's practical refrigeration, compiled by L. H. MORRISON (*New York and London: McGraw-Hill Book Co., 1928, 2. ed., pp. VIII+259, figs. 103*).—This is the second edition of this book (E. S. R., 47, p. 892). It contains chapters on elementary refrigeration, the evaporating system, compressors, condensers, installing refrigerating machinery, insulators, notes on rain water ice making, the absorption refrigerating system, the carbon dioxide refrigerating machine, and testing compression plants.

Testing domestic refrigerators, W. M. TIMMERMAN and H. A. WHITESEL (*Refrig. Engin., 15 (1928), No. 6, pp. 151–156, 158, figs. 8*).—Laboratory tests of domestic refrigerators are described, the purpose being primarily to outline the technique necessary.

Insulation for refrigerators, W. C. HAMMOND, JR., and F. C. VILBRANDT (*Jour. Elisha Mitchell Sci. Soc., 43 (1927), No. 1–2, pp. 63–66*).—Studies of the insulating properties of wood shavings, sawdust, cotton, brick, and 85 per cent magnesia asbestos, conducted at the University of North Carolina, are reported. Dry walls 2, 4, and 6 in. thick and wet walls 6 in. thick were tested.

The 6-in. thickness of cotton and asbestos gave the best results, but the 4-in. thickness of asbestos was very effective and one of the cheapest insulators. It is not subject to mildew that would occur on cotton and also is not affected by rot and odors so prevalent with planing shavings and sawdust. Apparently wet sawdust is a better insulator than dry sawdust, the results indicating quite an advantage in wetting this material. However, this is the only substance that showed such a phenomenon.

Strength tests of soldered and riveted joints, J. G. DENT (*Agr. Engin., 9 (1928), No. 10, pp. 315–317, figs. 9*).—Tests conducted at the Minnesota Experiment Station on the strength of soldered and riveted joints are reported. The results suggest that, in soldering, a standard half-and-half solder should be used and the metals should be pressed closely together for lap seams. A ⅛-in. lap was found to be practically equal in strength to No. IX tin plate, and a ¼-in. lap to IXXXX tin plate. A ½-in. lap will give approximately 90 per cent of the strength of 22-gauge galvanized steel. It was also found that a soldered lap joint if subjected to severe strains should be riveted, then soldered.

Simplified Pitot tube calculations on air ducts and air piping, C. A. Bennett (*Agr. Engin., 9 (1928), No. 10, pp. 322, 323, figs. 4*).—In a contribution from the U. S. D. A. Bureau of Public Roads, formulas and graphic data are presented for making air-volume calculations in the ducts or piping systems of fans and blowers.

The chlorination of raw sewage for odor control, J. L. Barron and R. E. Lawrence (*Kans. Univ., Engin. Bul. 16 (1928), pp. 23, figs. 12*).—Experiments conducted at three different localities in Kansas showed that objectionable sewage plant odors are caused generally by hydrogen sulfide. The production of hydrogen sulfide occurs in sewage having a high sulfate content, and is facilitated by long laterals and mains having flat grades, and in other places by contact with accumulated masses of decomposing organic matter or by mixing with septic liquor.

It has been found that odors can frequently be materially reduced by correcting flow conditions through the treatment plant. Less than one part per million of hydrogen sulfide in the tank effluent is not objectionable. Chlorine has been found to destroy hydrogen sulfide in definite proportions and to kill hydrogen sulfide-producing organisms. Definite odor reduction can be obtained by maintaining residual chlorine in the tank influent, but an excess is not necessary in the effluent.

RURAL ECONOMICS AND SOCIOLOGY

[Papers presented at the eighteenth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 10 (1928), Nos. 3, pp. 357–396; 4, pp. 516–524, pls. 2*).—Included are papers presented at the meeting previously noted (E. S. R., 58, p. 400), as follows: A State Program of Farm Organization Research, by H. C. M. Case (pp. 357–374); The Contribution of Farm Management in the Development of Agricultural Extension Programs, by H. M. Dixon (pp. 375–383); Farm Management Demonstrators' and Agricultural Extension Programs, by E. Merritt (pp. 384–391); Types of Economic Material Used in Developing an Agricultural Program in North Dakota, by O. M. Fuller (pp. 392–396); and The Michigan Land Economic Survey, by W. De Vries (pp. 516–524).

Research method and procedure in agricultural economics, I, II, J. D. Black et al. (*[Washington, D. C.]: Social Sci. Research Council, Advisory Com. Econ. and Social Research Agr., 1928, vols. 1, pp. [3]+196, figs. 5; 2, pp. [2]+197–468, figs. 19*).—This publication is discussed editorially on page 308.

The work of the International Institute of Agriculture, G. de Michelis (*Rome: Internatl. Inst. Agr., 1928, pp. VIII+130*).—This is the first part of the presidential report to the ninth meeting of the general assembly of the International Institute of Agriculture, and covers the membership and finances of the institute, the position of the services and staff questions, the organs of consultation and collaboration and the work of the institute, and the problem of its relations with other international bodies and particularly with the League of Nations.

Appendixes include a list of the members of the permanent committee, total paid and outstanding contributions of adhering States, regulations of the International Permanent Commission of Agricultural Associations and a list of the agricultural associations represented in the commission, and the regulations of the International Scientific Agricultural Council and of the International Commission for Coordination in Agriculutre.

[Report of the special committee on agriculture of the Chamber of Commerce of the United States], D. B. HEARD ET AL. (*Chamber Com. U. S. A. Referendum 52* (*1928*), *pp.* [8]+*43*, *figs* *2*).—This is a referendum sent to members of the Chamber of Commerce of the United States on the report and the seven recommendations of the special committee on agriculture presented to the board of directors on May 5, 1928. Included on alternate pages are the committee's report and the arguments in the negative on the report. The personnel of the committee, the ballot, and graphs showing the purchasing power and acreage and production the following year of wheat and cotton from 1910 to 1926, inclusive, are also included.

Farm land requirements for agricultural products in foreign trade, J. PERLMAN (*Jour. Land and Pub. Utility Econ.*, *4* (*1928*), *No. 3*, *pp. 283–288*).—This study was made to determine the practicability of the proposal that United States agriculture can be stabilized by doing away with foreign exports of agricultural products and utilizing the land thus thrown out of cultivation to raise products now imported. Based on data included in the Yearbook of Agriculture, 1926 (E. S. R., 57, p. 686), tables are compiled showing the acreage necessary to produce the net exports of wheat, corn, oats, barley, rye, rice, cotton, and tobacco, the net imports of flaxseed, and the acreage of sugar beets necessary to produce one-half the net imports of sugar.

The conclusion is reached that the proposal would result in from 9 to 12 per cent of the total crop acreage being thrown out of cultivation and nearly 3,000,000 people being compelled to leave the farm.

The law of diminishing returns as it affects British agriculture, A. AMOS (*Agr. Prog.* [*Agr. Ed. Assoc., London*], *5* (*1928*), *pp. 32–38*).—The author discusses the paper by Frecheville previously noted (E. S. R., 58, p. 887), disagreeing with the conclusions reached therein.

Agricultural regions of North America.—Part VI, The spring wheat region, O. E. BAKER (*Econ. Geogr.*, *4* (*1928*), *No. 4*, *pp. 399–433*, *figs. 23*).—This is the sixth article of the series previously noted (E. S. R., 59, p. 383).

Correlation of physical and economic factors as shown by Michigan land economic survey data, W. DEVRIES (*Jour. Land and Pub. Utility Econ.*, *4* (*1928*), *No. 3*, *pp. 295–300*, *fig. 1*).—The correlation in three counties between the natural districts as determined by the nature of soil, drainage, topography, and natural forest cover and the local experience in land utilization as shown by the amount and assessed valuation per acre of land in farms, the amount of abandoned farm land, and assessed valuation per acre of wild land is analyzed and found to be close.

The agricultural industry of southeastern Pennsylvania, H. F. JAMES (*Thesis, Univ. Penn., Philadelphia, 1928*, *pp. XI+168*, *figs. 22*).—This is a study in economic geography presented to the University of Pennsylvania in partial fulfillment of the requirements for the degree of doctor of philosophy.

How Wisconsin farmers become farm owners, B. H. HIBBARD and G. A. PETERSON (*Wisconsin Sta. Bul. 402* (*1928*), *pp. 35*, *figs. 10*).—This study, made in cooperation with the U. S. Department of Agriculture, is based upon 2,557 replies to a questionnaire sent to approximately 10 per cent of the farmers in each county of the State and upon supplementary data from about 350 retired farmers.

Tables and graphs are included showing for all the data and in some cases separately for the northern and southern sections of the State the number and percentage of owners who have climbed by different "agricultural ladders" to ownership; the changes in routes to ownership from before 1872 to 1917–1922; the changes in percentages of owners, and the relation of different sizes of home farm to the percentage of operators, passing through the tenant stage; the changes in age at which ownership was acquired; methods of acquiring land; the relation between size of home farm and size of the first farm owned and the percentage of operators acquiring farms from relatives and from others; the comparisons of average size of farms showing increase, decrease, or no change, and of land owned, operated, and in first farm owned, for farmers becoming owners at different periods; the relations between age of farmer and acreage owned, number of farms occupied as owner and acreage owned, and size of home farm and acreage in first farm owned and acres owned in 1922; relations of size of home farm and first farm owned to number of years spent on home farm in unpaid labor, and of size of home farm and percentage of operators working on home farm and on other farms as hired men; the percentage of tenants who spent different number of years on the present farm; and the relation of size of first farm rented to number of farms occupied as tenants. Some comparisons are made with findings in similar studies in Kansas, Nebraska, Iowa, Illinois, Minnesota, and Massachusetts.

Tenancy varied from as low as 3 to 5 per cent in counties in the northern part of the State to over 30 per cent in several counties in the southern part, the average for the State being less than 16 per cent. The percentages for the State and the northern and southern parts, respectively, climbing the different "ladders" to ownership were for those born on farms and having had no occupation but farming 45.4, 37.2, and 54.9; born on farm but having had other occupation 29.5, 33.8, and 24.3; born in town and never having lived on farm without wages 12.1, 14.1, and 10.1; born off the farm but coming to farm at comparatively early ages with fathers 9.2, 11.1, and 6.9; and other or unspecified, 3.8 per cent for all sections. The percentage coming from hired man direct to ownership decreased quite steadily, and that coming through the stages of hired man and tenant to ownership increased quite steadily, from 1872–1876 to 1917–1922.

The most usual age of acquiring ownership rose from 24 to 26 years before 1882 and from 30 to 32 years for the period 1912–1922 in the southern part of the State, while in the northern part there was little change, the usual age being from 27 to 29 years. The least change was found in those who passed through the tenant stage.

Ownership of the first farm acquired was wholly by purchase in 65.9 per cent, and partly by purchase in 17.3 per cent of the cases studied. The percentage of purchasing from relatives was found to have increased during recent years. The size of the first farm owned was found to increase as the size of the home farm and the number of years spent as a tenant increased. The average size of the first farm owned changed but little through the period studied. The owners had operated farms an average of nearly 18 years and had owned an average of 1.46 farms each. Nearly 68 per cent had occupied but one farm, and about 20 per cent more than two farms. Only 54 per cent of the 336 retired farmers still owned land.

Little change was found in the time spent by boys on the home farm without wages, but the time on larger farms was greater than that on the smaller ones. Nearly 60 per cent of those born on farms and working at nothing but farming had been hired men. Fifty-four per cent of all operators and 70 per cent of those who had been tenants had been hired men. Of all farmers studied, 54.3 per cent had at some time been employed otherwise than in farming. The length of time spent in the tenant stage showed a positive but no great increase during the period studied, being an average of 4 or 5 years for the farms acquired 30 to 50 years ago and 6 or 7 years for those acquired recently. The percentage of tenants living on but one farm increased from 56.4 to 64.5. The average number of farms lived on by each tenant was 1.83 in the northern counties and 1.55 in the southern counties, and the average length of occupation per farm was 3.4 and 4.5 years, respectively.

Recent changes in farm organization in western Canada, J. E. Lattimer (*Jour. Land and Pub. Utility Econ., 4 (1928), No. 3, pp. 243–250, figs. 2*).—The changes in the number of farms, acres occupied, improved, and cropped, the average value of field crops per farm, the relation of general prices and prices of farm products, etc., in Manitoba, Saskatchewan, and Alberta are discussed, with special reference to the period 1921 to 1926, inclusive.

Land credit in Walnut Grove Township, Knox County, Illinois, D. Rozman (*Jour. Land and Pub. Utility Econ., 4 (1928), No. 3, pp. 305–312, figs. 4*).—This is a study of farm credit from 1850 to 1925, inclusive, in a community where the percentage of land area mortgaged has decreased from 33.7 in 1880 to 21.9 in 1925, and the percentage of tenancy has increased from 28.8 to 46.4 in the same period.

Report of the Committee on Rural Credits in Australia, R. R. Enfield et al. (*London: Dominions Off., 1928, pp. 31*).—This is the report of a committee composed of representatives of Great Britain and Australia and of cooperative organizations. It correlates the Australian schemes for long-term or mortgage credit, marketing credit, and production credit with those of other countries, and makes suggestions for the development of the present Australian system.

Rural taxation, F. P. Weaver (*Pennsylvania Sta. Bul. 230 (1928), p. 10*).—Expenditures of county funds were found to have increased about 150 per cent from 1913 to 1926. Data from 100 rural school districts showed that since 1900 expenses have increased 325 per cent, State aid 195 per cent, and local taxes 435 per cent. Data assembled on wealth, income, and taxes of different groups in the State indicated that farmers pay $39.62 in taxes out of a per capita income of $202, and that other citizens pay $76.10 out of an average income of $812.

The tariff on animal and vegetable oils, P. G. Wright (*New York: Macmillan Co., 1928, pp. XVIII+347, figs. 20*).—This investigation is the fourth of the series previously noted (E. S. R., 56, p. 486). It discusses the elements of the oils tariff problem; the properties, uses, and commercial importance of the fatty oils; the position of the domestic industry and the oils duties in recent tariff acts; and the effects of the changes on prices, production, and trade.

The conclusions reached in regard to the effects of the duties on the different oils are as follows: On butter, the duty has been only partially effective, and while beneficial to the dairy industry it has been burdensome to consumers though to an amount much less than the duty; olive oil, the duty is of little importance, except for some revenue value; flaxseed and linseed oil, the duty benefits oil manufacturers to the full amount, burdens all consumers of paints, etc., to the full amount, benefits flax growers, who are less than 1 per cent of all farmers, to much less than the full amount of the duty, and burdens all other farmers; castor oil, no benefit and the removal would greatly benefit industrial uses; fish oils and lard, tallow, and other animal greases, the duty is nominal and has practically no effect on prices; and cottonseed, peanut, coconut, and soy bean oils, while there has been some benefit to dairy interests and cottonseed and peanut growers, there has been considerable burden on oil refiners and soap manufacturers.

Appendixes include tables on production, trade, revenue, and prices of the several oils (pp. 257–285); a discussion of the effects of a duty on price and output with special reference to butter and flaxseed, including formulas for estimating the effect of a duty (pp. 286–319); discussions of the application of the "equalizing rate" to the fatty oils (pp. 320–331) and to linseed oil (pp. 332–334); table of oil content of oil-bearing seeds (p. 335); and table showing the uses of the animal and vegetable oils and fats, classified by oils and fats (pp. 336–339).

Facts and statistics about the Philippine sugar industry, compiled by G. H. FAIRCHILD ET AL. (*Manila: Philippine Sugar Assoc., 1928, pp. [10]+88, pls. 3, figs. 4*).—This pamphlet was prepared by the Philippine Sugar Association to give information as to the present status and future prospects and potentialities of the Philippine sugar industry.

Included are a brief history of the industry, by G. H. Fairchild (pp. 37–57); a graph for estimating costs, by C. Locsin (pp. 59–64); the Timberlake resolution introduced in the U. S. House of Representatives to authorize the restoration of a limitation on the duty-free importation of Philippine sugar into the United States (pp. 65, 66); extract from the inaugural address and the first message to the Philippine Legislature of Governor General H. L. Stimson (pp. 67–79); extract from the hearings before the U. S. Senate Committee on Finance of the Sixty-second Congress on the duties on and manufacture of sugar and molasses (pp. 81, 82); and tables and statistics and other statements regarding the world's production and consumption of sugar and the Philippine sugar industry.

The arguments for and against the free entry of Philippine sugar into the United States are discussed (pp. 1–34).

Economic aspects of the fresh plum industry, E. RAUCHENSTEIN (*California Sta. Bul. 459 (1928), pp. 26, figs. 6*).—This bulletin assembles and analyzes the available data on the plum industry regarding production, crop movement, relation to other fruits, utilization, and the relationship between supply and price. Tables and graphs are included showing the distribution and trend of bearing and nonbearing trees in the United States by States and sections and bearing trees in California by counties, the trend of California shipments, the United States shipments by regions and months, and the seasonal variations and variations in prices by varieties, and the relation of prices to quantities sold.

A fairly consistent relationship was found to exist between the quantity sold from year to year and the price received. It was found that the variety bringing the highest price varied from season to season. The price was affected mainly by the quantity of plums rather than by the supply of all other fruits available at the time. It does not appear that the demand for plums in the next three years will increase any faster than the increase in the bearing acreage in California, and consequently the trend in prices is not likely to continue upward.

The fruit and vegetable supply for fifteen cities, D. M. JAMES (*Penn. Dept. Agr. Bul. 461 (1928), pp. 98, figs. 6*).—Tables are given showing the car lots received and the State of origin of different fruits and vegetables in 1927 by months at 15 Pennsylvania cities.

Crops and Markets, [October, 1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 10, pp. 361–400, figs. 2*).—This number includes tables, graphs, notes, reports, and summaries of the usual types.

Cooperative marketing of agricultural products, M. MURPHY (*Univ. Col., Cork, Agr. Bul. 3 (1928), pp. 140, figs. 4*).—The problems of marketing and cooperative marketing agencies are outlined; the types of cooperative marketing organizations are discussed and illustrated by descriptions of important associations, federations, and pools in the United States and Canada; and the essential preliminaries to cooperative marketing, the membership contract, the pool, management, finance, merchandising policies, and the possibilities and limitations of cooperative marketing are discussed.

Cooperative marketing of grain in the United States and Canada, J. F. Booth (*Jour. Farm Econ., 10 (1928), No. 3, pp. 331–356, fig. 1*).—The history and present status of cooperative marketing of grain in the United States and Canada are reviewed and the fundamental differences in the two countries and the present trends are discussed.

Ex-European trade in wheat and flour, M. K. Bennett et al. (*Wheat Studies, Food Research Inst. [Stanford Univ.], 4 (1928), No. 9, pp. [1]+307–356, figs. 2*).—This is a study of the trade of net importing countries outside of Europe, with special reference to the pre-war and post-war volume, the sources of imports, and the outlook for expansion. It is based upon Broomhall's records of overseas shipments to ex-European destinations; official statistics reported in Yearbooks of the International Institute of Agriculture, supplemented by data from official trade reports of particular countries; and official statistics in trade reports of net exporting countries.

British parcels prices: A world wheat price series, M. K. Bennett et al. (*Wheat Studies, Food Research Inst. [Stanford Univ], 4 (1982), No. 8, pp. [1]+289–306, figs. 9*).—This world wheat price series was constructed to serve "as a central representative series for short-time comparisons with cash wheat prices in the great wheat-producing and wheat-consuming countries of the world; and for comparisons of cash wheat prices on the world market udertaken to ascertain what particular types and grades are normally premium or discount wheats, and how relationships shift from year to year."

It is an unweighted simple weekly average of prices for each day's sales of parcels in the United Kingdom beginning with the week ended August 5, 1922, and ending June 30, 1928. Comparisons are made with other price series and with the prices of particular types of wheat.

Markets and fairs in England and Wales.—Part II, Midland markets. Part III, Northern Markets (*[Gt. Brit.] Min. Agr. and Fisheries, Econ. Ser. 14 (1927), pp. 161, [pls. 18], figs. [6]; 19 (1928), pp. 179, [pls. 27], figs. [9]*).—These numbers of the series previously noted (E. S. R., 57, p. 885) summarize for their respective sections the markets as a whole, analyze the market positions county by county, and describe some of the markets of general or special interest.

Economic conditions in Welsh agriculture: Suggestions of some remedies, A. W. Ashby (*Aberystwyth: Univ. Col., Agr. Econ. Dept., 1928, pp. 37*).—This paper, prepared for the agricultural education committee of the Welsh Council of Agriculture, discusses the prices of farm products and of farm requirements, crop and livestock production, and farm marketing, and suggests some possible remedies.

An appendix (pp. 30–35) includes a study of Labour Organisation on Welsh Farms, by J. L. Davies.

Living conditions among white land-owner operators in Wake County, W. A. Anderson (*North Carolina Sta. Bul. 258 (1928), pp. 49, figs. 7*).—This study, carried on in cooperation with the North Carolina Department of Agriculture, is based upon data obtained by a survey made during the months of November, 1926, to January, 1927, inclusive, and covering the year ended October 31, 1926. Data were obtained regarding 294 white farm owning and operating families, being 14.2 per cent of the total white farm owner operators of the county.

Tables and graphs are included showing age, education, farming experience, years spent in different tenure classes, and mobility of owner operators; size of families; acreage owned, operated, and cropped; sources of income; distribution of income from crops, animal and animal products, labor, and investments; distribution of total expenditures, farm expenditures, investment costs, family living expenses, and home and household costs; expenditures for clothing, health, personal expenses, insurance, church and charity, education, reading material, social and recreational activities, and automobiles; and food and fuel produced and purchased. Other tables show distribution of clothing expenditures by age and sex groups and books purchased and size of libraries.

The average cash income per farm was $2,505, 57.8 per cent of the group receiving less than $2,000 and only 15.7 per cent receiving over $4,000. Sixty-four per cent of the income was from crops, 7 from labor, 13 from animals, and 15.8 per cent from investments. The average cash expenditure was $2,372, of which 36.1 per cent was farming expense, 19.7 for investment, 6.9 for food, 7.3 for household, 12.3 for clothing, 3.4 for health, 1.4 for insurance, 2.4 for education, 0.6 for reading, 1.8 for personal expense, 5.6 for automobile, 2.2 for church, and 0.4 per cent for recreation. Farm expenditures correlated with investment expenditures gave a coefficient of —0.8169.

The Utah farm village of Ephraim, L. NELSON (*Brigham Young Univ. Studies No. 2 (1928), pp. 41, figs. 5*).—This study, made in cooperation with the Bureau of Agricultural Economics, U. S. D. A., is the second dealing with the main community types in rural Utah. The present study deals with a farm village about twice the size and less isolated than the farm village previously studied (E. S. R., 54, p. 288).

The automobile and the village merchant (*Ill. Univ., Com. and Business Admin., Bur. Business Research Bul. 19 (1928), pp. 42*).—This study of the influence of automobiles and paved roads on the business of Illinois village merchants is based upon interviews obtained from visits to 45 villages in 19 counties. The factors influencing sales, and the relation of size and location of villages, location of stores on highways, and types of merchandise to sales trends in village stores are discussed.

Summaries of 108 interviews are given under the following groupings: Villages of between 400 and 800 population on paved roads, villages of less than 400 population on paved roads, villages not on paved roads, and villages with populations between 800 and 1,700.

Rural sociology, J. M. GILLETTE (*New York: Macmillan Co., 1928, rev. ed., pp. XIII+574, figs. 18*).—The work previously noted (E. S. R., 48, p. 189) has been revised and given a more sociological trend. The factual and statistical statements are brought up to date; portions, especially those dealing with population, health, tenancy, labor, and the relation between town and country, have been rewritten; and the part pertaining to economic conditions and problems has been reduced and that covering technically economic subject matter eliminated. A new chapter on standards of living among farmers has been added.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

List of technical workers in the Department of Agriculture, and outline of Department functions, 1928 (*U. S. Dept. Agr., Misc. Pub. 32 (1928), pp. X+107*).—The technical workers of the Department in Washington and in the field are listed by bureau divisions. A name index and a brief outline of the principal functions of the bureaus and other major divisions of the Department are included.

Report on agricultural education in Scotland, 1927, J. R. Campbell (*Edinburgh: Bd. Agr. Scotland, 1928, pp. 31*).—This report, which is supplemental to that previously noted (E. S. R., 52, p. 695), presents the results of an inquiry made to ascertain how far agricultural education is reaching those actually engaged in farming or farm work and how immediately effective it is in improving farm practices.

Agricultural education was found to have effected great improvements, especially in dairying, manuring, seeding, and poultry keeping, but not to have reached a sufficiently large proportion of those farming, due to the fact that the habits and minds of the less progressive farmers had become formed and fixed before the attempt to educate them in technical agriculture commenced. The usefulness of scientific instruction, except to young persons already prepared by sound general elementary education, is deemed doubtful. For the educated progressive farmer lectures and demonstrations by specialists, rather than general courses, are advised. Organization directed to self-education of young farmers and farm workers is deemed an essential objective of local winter courses.

The practical education of women for rural life, G. Denman et al. (*London: Min. Agr. and Fisheries, 1928, pp. 61*).—This report of a subcommittee of the interdepartmental committee of the Ministry of Agriculture and Fisheries and the Board of Education is based upon interviews with 35 persons. It is divided into four sections covering the practical education of women, the practical training of girls from 14 to 16 years of age, and of girls in rural schools, and conclusions and recommendations.

A textbook of general botany, G. M. Smith et al. (*New York: Macmillan Co., 1928, rev. ed., pp. X+539, pls. 7, figs. 416*).—This is a general revision and enlargement of the text previously noted (E. S. R., 51, p. 693).

Elements of botany, R. M. Holman and W. W. Robbins (*New York: J. Wiley & Sons; London: Chapman & Hall, 1928, pp. VII+380, figs. 241*).—An abridgment of a text previously noted (E. S. R., 52, p. 397) for use in a one-semester course in general botany.

Elementary lessons on insects, J. G. Needham (*Springfield, Ill.: C. C. Thomas, 1928, pp. VIII+210, figs. 72*).—An outline for a brief introductory course in entomology is presented.

Elements of farm practice, A. D. and E. W. Wilson (*St. Paul, Minn.: Webb Pub. Co., 1926, 11. ed., pp. 368, pl. 1, figs. 152*).—This is a revised edition of the text previously noted (E. S. R., 35, p. 93).

FOODS—HUMAN NUTRITION

Composition of bone.—IV, Primary calcification, B. Kramer and M. J. Shear (*Jour. Biol. Chem., 79 (1928), No. 1, pp. 147–160*).—The theoretical conclusions concerning the physicochemical mechanism of calcification of the bones noted on page 310 have been tested by analyses by the micro method noted on page 312 of the bones of normal rats and of rats in the early days of healing of rickets (primary calcification). Unashed normal rat bones gave an average value of 1.99±0.01 for the ratio residual Ca : P, which is in agreement with reported results of analyses of large amounts of bones by macro methods. The ratio of carbonate calcium to total calcium increased from 8 to 10 per cent in the bones of young rats to 15 or 16 per cent in those of adult rats. The proportion of carbonates in rachitic bones was greater than in normal bones of the same age.

In primary or early calcification of rachitic bones the average ratio of residual Ca : P had the high value of 2.23±0.03. The high ratios which were obtained regardless of the nature of the calcifying agent are interpreted as indicating the presence of a basic calcium salt in freshly deposited bone salts.

The solubility in the stomach and duodenum of aluminum compounds found in baking powder residues, V. C. MYERS and J. A. KILLIAN (*Jour. Biol. Chem.*, *78* (*1928*), *No. 3, pp. 591–594*).—This paper and the three noted below deal with the general question of the content of aluminum in the animal body under varying conditions. In the present study the ingestion of test meals of baking powder biscuits and water, furnishing from 15 to 90 mg. of aluminum, was followed in the 18 subjects studied by the presence of from 0.4 to 14.6 mg. of aluminum in soluble form in the gastric contents. In six of the subjects the total aluminum of the gastric contents was also determined and the ratio of soluble to total aluminum was found to vary from 6 to 54 per cent, with an average of 25 per cent. The solubility appeared to bear no direct relation to gastric acidity.

The influence of the administration of aluminum upon the aluminum content of the tissues, and upon the growth and reproduction of rats, V. C. MYERS and J. W. MULL (*Jour. Biol. Chem.*, *78* (*1928*), *No. 3, pp. 605–613, fig. 1*).—Using the colorimetric method described on page 312, the authors have determined the aluminum content of the tissues of four groups of rats (1) on a control diet, (2) on a diet with high aluminum content, (3) on an aluminum-free diet, and (4) following the intraperitoneal administration of aluminum. The aluminum, which was in the form of potassium aluminum sulfate, was fed in amounts furnishing 2 mg. of aluminum per rat per day for at least 100 days.

Minute traces of aluminum were found in the various tissues on all of the diets. In the liver the average amounts per 100 gm. of tissue were for the control diet 0.14, aluminum diet 0.18, aluminum-free diet 0.08, and aluminum administered intraperitoneally 8.22 mg. The aluminum-containing diets were fed for four generations, with no noticeable differences from the animals on the normal diet in behavior or in growth curves beyond a slightly greater initial growth in the rats receiving the aluminum.

The influence of the administration of aluminum upon the aluminum content of the tissues of the dog, V. C. MYERS and D. B. MORRISON (*Jour. Biol. Chem.* *78* (*1928*), *No. 3, pp. 615–624*).—An investigation similar to the above was conducted on dogs. As was the case with rats, small amounts of aluminum were found in the tissues of the normally fed dogs, and these amounts were not appreciably changed except in the liver following prolonged ingestion (three months) of aluminum in amounts of 0.23 and 1.55 gm. daily (6 and 2 animals, respectively).

In the normally fed animals, the amounts of aluminum found varied from 0.07 to 0.15 mg. per 100 gm. body weight, the largest amount being in the liver. In the livers of the aluminum-fed dogs, the average amount of aluminum was 0.27 mg. per 100 gm. The aluminum content of the bile was no higher than in the control animals. Following the parenteral administration of 5 mg. of aluminum daily for 2 weeks to 2 dogs, a marked increase in the aluminum content of the tissues was found 8 and 34 days after the administration of aluminum had been discontinued.

The aluminum content of human autopsy tissue, V. C. MYERS and J. W. MULL (*Jour. Biol. Chem.*, *78* (*1928*), *No. 3, pp. 625, 626*).—A few analyses for aluminum of human autopsy material are reported. These in general are in accord with the figures reported for the rat and dog, with the exception that the figures for liver are lower and for heart and brain higher.

Basal metabolism data on normal men and women (series II), with some considerations on the use of prediction standards, F. G. BENEDICT

(*Amer. Jour. Physiol., 85 (1928), No. 3, pp. 607–620*).—Supplementing the series of normal basal metabolism data published in 1919,[2] a second series is given for 27 men and 33 women, and the data of the new series are compared with those of the earlier series.

In the new series the ages of the men varied from 89 to 21 years, with an average of 34 compared with an average of 27 years for the 136 men in the first series. Other average values for the second and first series, respectively, are body weight without clothing 71.5 and 64.1 kg., height 173 and 173 cm., pulse rate 60 and 61, oxygen consumption per minute 237 and 233 cc., and heat production in 24 hours—total 1,648 and 1,632 calories, per kilogram of body weight 23.5 and 25.7, and per square meter body surface (Du Bois) 891 and 925 calories. The average deviations in the new series from three accepted standards are Harris-Benedict —1.8, Aub and Du Bois —4.4, and Dreyer —0.4.

The 33 women in the second series varied in age from 58 to 18 years, with an average of 32 years as compared with 31 for the 103 women in the first series. Other comparisons between the second and first series, respectively, are body weight without clothing 63.5 and 56.5 kg., height 161 and 162 cm., pulse rates 63 and 69, oxygen consumption per minute 194 and 194 cc., and heat production in 24 hours—total 1,352 and 1,319 calories, per kilogram of body weight 21.8 and 24.5, and per square meter of body surface 812 and 850 calories. The deviations from the standards were Harris-Benedict —4.2, Aub and Du Bois —7.3, and Dreyer —4.0.

The lower averages for total metabolism of both men and women are explained chiefly by the greater attention now being made to secure true basal conditions for the determinations.

The greatest discrepancies from the various standards were found in individuals of unusual configuration. In commenting upon this, the author states that "these comparisons lead to the conclusion that if predicted values for basal metabolism are to be used as criteria for determining medical or surgical treatment, a more critical consideration of the prevailing methods of prediction is imperative, especially as concerns the obese individual, those suffering from endocrine disturbances, and those of unusual configuration. Basal metabolism measurements in the clinic have too often been employed without due regard to the fact that even in a group of normal people the measured metabolism of some of the individuals may deviate from the standards by more than ±10 per cent and yet the person may be normal." The author is also of the opinion that "hospital normals" should not be used for obtaining physiological standards, although such use may be justified in determining clinical standards.

The data for women confirmed the conclusion of MacLeod, Crofts, and Benedict (E. S. R., 54, p. 487) that the present prediction standards for women are too high and should be lowered by about 5 per cent.

Although the individual data reported are not discussed in detail, an exception is made in the case of the oldest male subject, a well-known surgeon in excellent physical and mental health in spite of his advanced years. His metabolism was 26.2 per cent above the Harris-Benedict prediction and slightly above the other two standards. The possibility is suggested in his case of a supernormal metabolism consistent with his extraordinary physical well-being.

The basal metabolism of some browns and blacks in Jamaica, M. STEGGERDA and F. G. BENEDICT (*Amer. Jour. Physiol., 85 (1928), No. 3, pp. 621–633, fig. 1*).—This is the first report of the cooperative studies in racial metabolism under the auspices of the Nutrition Laboratory of the Carnegie Institution with the use of the new field respiration apparatus previously described (E. S. R., 59, p. 391). The observations were made on 37 male and 5 female brown and 8 male black subjects at Jamaica, British West Indies. The majority of the men were from Mico College and were from 19 to 22 years of age. The women were between 23 and 30 years of age, with the exception of one subject of 40 years. A large proportion of the subjects had hookworm, but were otherwise in good health.

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[2] Carnegie Inst. Wash. Pub. 279 (1919), pp. VI+266, figs. 30.

The average heat production of the 37 male browns was 5.4 per cent below the Harris-Benedict standards for white men of corresponding age, weight, and height. The small group of 5 female browns, however, had an average heat production only 3.4 per cent below the prediction standards for white women, standards which are now believed to be about 5 per cent too high. The average heat production of the 8 full-blooded male blacks was only 2 per cent below the standards.

In the absence of data on white subjects in the same locality and with the small number of determinations reported, it is thought that no definite conclusions can be drawn concerning the effect of climate on heat production, but the small difference observed between the metabolism of these subjects and that of whites in the northern latitudes is thought to suggest that the climate of this locality and the diet probably have no appreciable effect upon heat production.

The basal metabolism of Mayas in Yucatan, G. D. Williams and F. G. Benedict (*Amer. Jour. Physiol., 85 (1928), No. 3, pp. 634–649*).—This paper reports the second of the series of studies of racial metabolism in which data were obtained on the basal metabolism of a group of 32 male Mayas, workers in the archaeological excavations at Chichen Itzá, Yucatan. For purposes of comparison determinations were also made on white members of the expedition before, during, and after a short stay in Yucatan and on other white men and women who had been in Yucatan less than 4½ months.

The measurements on the white subjects showed that the subtropical climate had had no appreciable effect on their metabolism. The average basal metabolism of the Mayas was 5.2 per cent above the Harris-Benedict standards for white men of similar age, weight, and height. In discussing these results, various factors which might have influenced metabolism in one way or another are cited, and the conclusion is drawn that the high values are a true racial characteristic. This is considered of particular significance inasmuch as there has been a tendency to associate definitely low metabolism of various races with racial inferiority. "The contrast between the present-day civilization of Orientals, whose basal metabolism has been shown to be low, and of these Mayas argues against interpreting a low metabolism as an index of racial inferiority or a high metabolism as an index of racial superiority."

Although blood pressure determinations were not made in all cases, there appeared to be a distinct tendency toward high blood pressure. It is suggested that in the future more attention be paid to the determination of blood pressure as a part of the regular procedure in basal metabolism studies.

Age and basal metabolism of adults, F. G. Benedict (*Amer. Jour. Physiol., 85 (1928), No. 3, pp. 650–664*).—This contribution to the meager literature on the effect of increasing age on the basal metabolism of the same individuals consists of data obtained on four subjects, three male, including the author, and one female. In the female subject, a healthy woman of placid temperament, the determinations reported cover the period between the ages of 24 and 36 years and show a remarkably constant metabolism. In one of the three male subjects, on whom determinations were made at frequent intervals during 16½ years beginning at the age of 42 years and 10 months, the metabolism was essentially constant. The other two showed a decrease with increasing age. The determinations on one of these subjects were begun at the age of 30 years and 5 months and continued to the age of 49 years, and in the other were begun at 38 years and 5 months and continued to 57 years and 5 months. In the former the effect of age became distinctly pronounced at about 42 and in the latter at about 47 years. The constancy in metabolism in the first male subject is attributed to the compensating effect of increase in body weight and improvement in general physical condition.

In commenting upon his own subjective symptoms, the author admits a decline in physical vigor which may be in proportion to the decrease in basal metabolism, and in contrast calls attention to the superior vigor and high metabolism of the 89-year-old subject referred to above.

"This research indicates the importance of basal metabolism measurements as an index of the general level of vital activity, an index which we believe has heretofore been entirely overlooked by the average physician and, indeed, by life-insurance examiners. Measurements of the fluctuations in metabolism which are found in cases of endocrine disturbances are, to be sure, of great practical value to the clinician, but we believe it is equally important to keep a periodic record of the basal metabolism of the individual and thereby see what the course of the metabolism is with time. It is more than likely that differences found in its level may be directly interpreted in the equivalent of increase or decrease of physical vigor. Hence intelligent basal metabolism measurements are strongly to be recommended as a part of the annual assessment of physical condition."

Basal metabolism before and after a summer vacation, F. G. BENEDICT and M. D. FINN (*Amer. Jour. Physiol., 85 (1928), No. 3, pp. 665–671*).—To test the possible effect upon basal metabolism of a summer vacation of one month, determinations before and after such vacations have been made from time to time on members of the staff of the Nutrition Laboratory of the Carnegie Institution. Between 1910 and 1927, 20 individuals have been studied, most of them for one vacation only, but several for two or three vacations. Since the body weights in all cases remained practically constant, data are reported in terms of oxygen consumption alone.

In only two subjects was there any noticeable effect of the vacation on the metabolism. In one of these, a woman, there was a marked increase in metabolism following vacation in 1925 and also in 1927. In the other subject, a man, there was an increase in 1925 but not in 1927. It is concluded that the basal metabolism of an individual is in general so sufficiently fixed as to be unaltered by a summer vacation, even when pronounced subjective impressions of recuperation are felt.

The seasonal variation in basal metabolism, F. L. GUSTAFSON and F. G. BENEDICT (*Amer. Jour. Physiol., 86 (1928), No. 1, pp. 43–58, fig. 1*).—The subjects in this study were 20 young women students at Wellesley College who volunteered for basal metabolism determinations once a month except for July, August, and September between October, 1926, and January, 1928.

All of the subjects were not studied every month, and it was consequently impossible to obtain monthly averages. With certain exceptions, however, the observations showed a tendency toward a low metabolism in winter, followed by a rise to higher levels during the spring and summer. The month-to-month variations in the same subjects were considerable and are thought to suggest that the "metabolism of women is distinctly a labile process." The results obtained during the menstrual periods were suggestive of a lowered metabolism at this time.

Normal menstruation and gaseous metabolism, F. G. BENEDICT and M. D. FINN (*Amer. Jour. Physiol., 86 (1928), No. 1, pp. 59–69, fig. 1*).—Conflicting literature on the effect of menstruation on basal metabolism is reviewed, and data are reported on intermittent measurements over a period of 12 years of the metabolism on menstrual and intermenstrual days of a single subject whose metabolism has been studied very extensively. In addition to the data obtained in the course of other studies, practically daily consecutive measurements were made on this subject for over 2 months, including three menstrual cycles. Both in the scattered determinations over the longer periods and in the consecutive determinations a definite tendency toward a lowered metabolism was noted during the menstrual periods. The oxygen consumption in general was lowest and most uniform during this time and highest about 1 week after menstruation ceased.

Basal metabolism of young women, H. McKay (*Jour. Home Econ., 20 (1928), No. 8, pp. 591–594*).—Essentially noted from another source (E. S. R., 59, p. 288).

Vitamin A in yeast, H. E. Honeywell, R. A. Dutcher, and J. O. Ely (*Pennsylvania Sta. Bul. 230 (1928), p. 8*).—A preliminary study of the vitamin A content of yeasts from various sources has suggested not only that yeast contains vitamin A, but that possibly vitamin A may consist of more than one factor.

Vitamin A deficiency in the guinea-pig, S. B. Wolbach and P. R. Howe (*Arch. Path. and Lab. Med., 5 (1928), No. 2, pp. 239–258, figs. 11*).—A detailed study of the pathology of simple vitamin A deficiency in the guinea pig is reported, with microphotographs of the lesions in the trachea, bladder, thymus, uterus, and submaxillary glands. Difficulties reported by Boock and Trevan (E. S. R., 49, p. 262) in obtaining satisfactory experimental diets were overcome by placing the guinea pigs when from 4 to 6 weeks of age on a diet of casein 15, starch 74, butterfat 6, Osborne and Mendel's salt mixture 3, and yeast 2 parts, with 20 cc. of orange juice per guinea pig daily. After the animals had been on this diet for about 4 weeks the orange juice was cut down to 4 cc. daily and lard substituted for the butter. In the preliminary period the animals grew from an average weight of 350 gm. to from 550 to 560 gm. After the change to the deficient diet the gains in weight continued for periods of from 4 to 6 weeks, after which there was a rapid decline in weight, the animals dying in from 66 to 110 days.

The loss in weight was practically the only external evidence of vitamin A deficiency. Lesions of the eye did not occur. The changes observed on autopsy resembled in many respects those observed in rats (E. S. R., 54, p. 891). Keratinizing epithelium was found in the respiratory tract in the nares, larynx, trachea, and bronchi; in the alimentary tract in the submaxillary glands, the parotid glands, and the accessory salivary glands of the tongue and pharynx; and in the tissues and organs of the genito-urinary tract. Of the ductless glands, the thymus alone showed changes, in particular marked atrophy.

In contrast to the rat there was extensive formation of keratinizing epithelium before the occurrence of pronounced atrophy of the organs concerned. This began simultaneously or in sequence in many foci and appeared to grow rapidly and continuously.

The relative food values of brown (from "entire" wheat grain) and white (from endosperm of grain) wheaten flour, and their comparative potency for the prevention of xerophthalmia in guinea-pigs, E. J. Sheehy (*Roy. Irish Acad. Proc., 37 (1927), Sect. B, No. 27, pp. 415–425*).—A slight superiority of whole-wheat flour over patent flour in its content of vitamin A has been shown in a series of feeding experiments conducted on guinea pigs. In the general discussion of the relative value of brown (whole-wheat) and white (patent) flour, it is emphasized that both flours are deficient in a number of essential nutritive factors, but that these deficiencies are not significant when the diet is liberal and varied. The difference in content of vitamin A is thought to be of significance only when the diet is extremely restricted, as when it consists largely of bread supplemented by margarine, jam, and perhaps fruits. Under these conditions whole-wheat flour should be recommended in place of white flour.

Beri-beri columbarum, R. McCarrison (*Indian Med. Research Mem. 10 (1928), pp. [5]+146, pls. 7, figs. 16*).—This memoir is a continuation of an earlier one on the relationship of rice to beriberi in India.[3] It attempts to throw light on the relationship between beriberi in man and polyneuritis in fowls by presenting a large amount of evidence indicating that whereas the typical avian polyneuritis is produced by the entire absence of the antineuritic vitamin, a condition resembling human beriberi much more closely, particularly in the hypertrophy of the heart, is produced in pigeons by an unfavorable proportion but not absolute deficiency of this vitamin. This has been shown both by gradually reducing and increasing the antineuritic vitamin content of the basal ration, in both cases symptoms of beriberi appearing when the antineuritic vitamin value of the ration is from 20 to 50 per cent below the minimum required for the maintenance of normal metabolism. In endeavoring to explain this, the author advances the theory, similar to one proposed many years ago by Eijkman, that "the ultimate cause of the disease is not the negative factor of vitamin insufficiency but a positive and toxic agent produced in the course of a disordered metabolism arising out of insufficiency of vitamin B in the food. The clinical and pathological manifestations of beriberi are due in whole or in part to this specific agent. The existence of this agent has been demonstrated on pathological grounds and by statistical examination of the experimental data."

Included in the experimental work reported are studies on the relative vitamin B content as determined on rats of whole rice and whole wheat, white rice and white flour, and of dhal, atta (whole wheat), and polished and unpolished rice, the studies showing in all cases the superiority of wheat over rice. Dhal, an Indian pulse, was found to have about the same value as atta as a source of vitamin B, but the latter is recommended in preference to it, as it is possible to eat larger amounts of the atta than of dhal. The publication contains three appendixes as follows: Statistical Examination of the Experimental Data Relating to the Heart, by E. R. Sundararajan (pp. 59-88); The Aerobic Spore-Forming Bacilli in Rice, by T. H. Gloster (pp. 89-117); and Weights of Organs in Healthy Indian Pigeons, by the author (pp. 118-137).

Some recent advances in our knowledge of rickets and allied diseases, I, II, L. G. Parsons (*Lancet [London], 1928, II, Nos. 9, pp. 433-438; 10, pp. 485-489), fig. 1*).—In two lectures delivered at the University of Birmingham, the author traces recent developments in the knowledge of the etiology of rickets leading to the conclusion that "rickets is a disorder of calcium and phosphorus salt metabolism, usually the result of defective absorption of these elements from the bowel; further, that this defective absorption is due either to an inefficient supply of these elements, or of some activating body in the tissue fluids; that this body is probably vitamin D, which in its turn is derived from the alimentary canal, or synthesized by the action of ultra-violet rays on sterols in the skin; but that occasionally the faulty metabolism may be entirely endogenous in origin, as occurs in renal rickets; and finally, that growth is an essential for the development of rickets."

Clinical experience with irradiated ergosterol, A. F. Hess and J. M. Lewis (*Jour. Amer. Med. Assoc., 91 (1928), No. 11, pp. 783-788, figs. 8*).—The authors review briefly the literature on the irradiation of ergosterol and discuss their own clinical experience in the use of irradiated ergosterol in the treatment of infantile tetany and rickets. They state that their experience "can be summarized by the statement that this drug never failed in rickets; that even in many cases in which cod-liver oil had not brought about healing, irradiated ergosterol initiated a rapid cure."

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[3] Indian Med. Research Mem. 2 (1924), pp. 87, pl. 1, figs. 8.

The extreme rapidity of the cure and the development of hypercalcemia from excess dosage are emphasized, although attention is called to the fact that in some of the recent literature on the possible harm from irradiated ergosterol the doses administered were at least 10,000 times greater than the minimal curative dose. It is thought that there has not yet been sufficient clinical experience to define the proper dosage.

In discussing the mechanism of the action of irradiated ergosterol, the possibility is suggested that its action on calcium metabolism is in the form of a stimulant for the parathyroid gland. No suggestion is made concerning the controlling mechanism for phosphorus, although it is noted that it must be quite different from that of calcium.

Cod liver oil for reproduction, V. E. Nelson, E. Ohrbeck, R. L. Jones, and M. W. Taylor (*Amer. Jour. Physiol., 85 (1928), No. 3, pp. 476–481*).—The authors report that cod-liver oil (Squibb), contrary to the statement of Evans and Burr (E. S. R., 58, p. 595), contains vitamin E. The minimum requirement for reproduction has not been determined, but seventh generation males and females have been raised on a synthetic diet containing 5 per cent of cod-liver oil as the sole source of vitamins A, D, and E. The other constituents of the diet were casein purified by washing with water acidified with acetic acid 18, yeast 12, McCollum and Davis' salt mixture (185) 3.7, and dextrin to total 100 per cent. In endeavoring to explain the reproductive success with this ration as compared with the failure reported by Evans and Burr, the possibility is suggested of the destruction of vitamin E in the cod-liver oil in the latter case by the lard or other fat used in the diet.

A peculiar phenomenon observed in some cases of failure at reproduction is described in considerable detail. On some of the cod-liver oil diets and on other food mixtures containing different sources of fat-soluble vitamins, high mortality at the time of parturition has been observed. The females at this time become very inactive and appear not to be in pain but to be unable to deliver their young. Autopsy has shown the fetuses to be healthy and normal in number.

The erythropoietic response of the various anemias to liver therapy, W. S. Middleton (*Jour. Amer. Med. Assoc., 91 (1928), No. 12, pp. 857–863, figs. 7*).—This paper and the five noted below constitute a symposium on anemias held by the section on pharmacology and therapeutics at the annual meeting of the American Medical Association at Minneapolis, Minn., June 13, 1928.

Previous reports in the literature on the specificity of liver and liver extracts for pernicious anemia are reviewed, and additional confirmation of its specificity is given in the report of the treatment of 40 cases of secondary anemia at the Wisconsin General Hospital. Of these 14 responded favorably to the Murphy-Minot liver treatment, but it was demonstrated that the response was not to the specific factor in the liver.

That copper is not the active agent in inducing remissions in penicious anemia is suggested by the failure of response in two cases of pernicious anemia to solutions of iron and copper in amounts equivalent to a 24-hour dosage of the liver extract. The author states in conclusion that "the indiscriminate use of liver in all types of anemia should be discouraged as confusing the picture of undiagnosed blood diseases, creating an empiric practice, and establishing an economic burden for the unfortunate patients with pernicious anemia, to whom liver has proved an inestimable boon. The use of liver and liver extract in the treatment of secondary anemia is an experimental problem, the solution of which depends on a close study of these cases, preferably in the clinic and the hospital."

Experimental anemias, diet factors, and related pathologic changes of human anemias, G. H WHIPPLE (*Jour. Amer. Med. Assoc, 91 (1928), No. 12, pp. 863–867, fig. 1*).—This is chiefly a review of the series of studies of the author and coworkers on experimental anemias in dogs (E. S. R., 59, p. 793), with an application of some of the principles established to the question of human anemias.

In the author's opinion, pernicious anemia belongs in the group of dietary anemias, in this case diets faulty in stroma building material or a disturbance of the stroma building mechanism. It is suggested that the specific substance or substances in liver may not be familiar to liver alone. Other materials which should be tested in various anemias include the kidney (sheep, calf, pig), chicken liver and gizzard, and liver sausage and blood sausage.

Liver fractions in pernicious anemia, R. WEST and E. G NICHOLS (*Jour. Amer. Med. Assoc., 91 (1928), No. 12, pp. 867, 868*).—Starting with the commercial liver extract made by the Cohn method (E. S. R., 59, p. 692), the authors have prepared by precipitation with phosphotungstic acid, fractionation of the decomposed phosphotungstates by the Kössel silver method, and reprecipitation of the active material from the filtrate after removal of the silver with phosphotungstic acid and decomposition as before a very active material, the best fractions of which contain from 12 to 14 per cent of nitrogen, no phosphorus or iron, only traces of sulfur, and probably no copper.

Impressions of nature of pernicious anemia in light of the newer knowledge, J. H. MEANS and W. RICHARDSON (*Jour. Amer. Med. Assoc., 91 (1928), No. 13, pp. 923–925*).—This is a general discussion of the probable nature of pernicious anemia in the light of the specific effect upon it of liver and liver extracts.

The treatment of pernicious anemia with liver and liver extract, T. ORDWAY and L. W. GORHAM (*Jour. Amer. Med. Assoc., 91 (1928), No. 13, pp. 925–928, figs. 4*).—Among the points brought out in this paper, in which are discussed the results obtained in 578 cases (25 in the authors' experience and 553 from the literature), are that strict adherence to the original Minot-Murphy diet is not essential provided sufficient liver is given, and that lack of success of the liver diet is due to infection or other complication, the giving of insufficient liver, incorrect diagnosis, or the effect of multiple transfusions. Several possible dangers are noted, including the use of impotent extracts, gout as a possible complication, and a possible renal effect after prolonged subsistence on the diet.

Pernicious anemia treated with liver diet and liver extract, E. H. HEATH (*Jour. Amer. Med. Assoc., 91 (1928), No. 13, pp. 928–934, figs. 8*).—In this discussion of the author's experience in the treatment of pernicious anemia by the liver diet at the Johns Hopkins Hospital clinic, it is noted that although it has been difficult to get the patients to eat adequate amounts of liver at first a marked improvement in appetite usually takes place, particularly with respect to liver itself.

A discussion of these papers is given in abstract.

TEXTILES AND CLOTHING

Studies in flax retting, A. Trevithick, B. B. Robinson, and R. M. Snyder (*Michigan Sta. Tech. Bul. 95 (1928), pp. 49, fig. 1*).—The principal conclusions from investigations by Trevithick on aerobic spore bearing bacteria isolated from retted flax fiber and on pure culture retting have been recorded earlier (E S. R., 55, p. 896).

Robinson and Snyder observed that the acidity developing in a ret is important, since the retting of flax in water proceeded faster when the pH was neutral. The quality of fiber from a ret at pH 7 was better than or as good as that from more acid or alkaline ret. Retting with buffers required a smaller addition of alkali, gave a faster ret than without the buffer, and produced a considerably stronger fiber for the same degree of retting. Passage of air through a retting solution kept the acidity from going very low and resulted in a slightly higher percentage of fiber than from the stagnant water retting. Retting in circulating water tended to become acid unless enough fresh water replaced the old water at least once in 6 hours, which made the entire control of acidity impractical. However, replacing the old water once in 24 hours was better than every 6 hours as it produced a fiber indicating better quality, being less harsh and containing more nature, although hackling a smaller percentage of line fiber.

The plasticity of wool, J. B. Speakman (*Roy. Soc. [London], Proc., Ser. B, 103 (1928), No. B 725, pp. 377–396, figs. 4*).—A series of experiments at the University of Leeds suggested that the elastic properties of wool are those of a structure consisting of elastic and plastic elements arranged in parallel. Extension tests indicated that wool fibers in water are imperfectly elastic owing to the plasticity and rupture of fibrillae within the constituent cells. The fibrillar plasticity of wool in water seemed due to hydrolytic changes associated with the peptide linkages. The results showed that the plasticity of wool can be reduced by those reagents which react or combine with imido groups, reducing their affinity for water and inhibiting hydrolysis of the peptide linkages.

Effect of twist on cotton yarns, A. A. Mercier and C. W. Schoffstall (*[U. S.] Bur. Standards Jour. Research, 1 (1928), No. 5, pp. 733–750, figs. 9*).—Seven counts of combed yarns were spun from middling cotton stapling $1\frac{1}{16}$ in. and 5 counts of carded yarns from 1-in. staple, using single and double roving organizations and different twist factors for each yarn.

Test results showed that the strength of a yarn increases with twist up to a certain point and then decreases as further twist is added. The covering power of a yarn appeared to be directly affected by the diameter; as twist is added within certain limits the diameter decreases. The relation of the angle of twist to yarn properties is also discussed. As twist increased, increases in draft were necessary in order to maintain a constant count. Suggestions are given in regard to the application of the data to the cotton mill.

X-ray methods used in determining structure of cellulose fibers, O. L. Sponsler (*Indus. and Engin. Chem., 20 (1928), No. 10, pp. 1060–1062, figs. 2*).—The status of X-ray studies with cellulose fibers (E. S. R., 58, p. 796) and methods involved are reviewed. It is pointed out that the very fine capillary tubelike character of the fibers complicates the investigation of their molecular structure by X-ray methods. An approximately parallel arrangement of the fibers into a block which can be turned as desired with respect to the X-ray beam gives a limited control of the atomic planes in the fibers. When the beam passes lengthwise through the fibers, the block resembles a mass of crystal powder, and at right angles to the fibers the block resembles in its reflections a single large orthorhombic crystal, whereas at any other position, on account of the cylindrical construction of the individual fiber, it resembles a block containing a few large crystals so oriented that their *b* axes are parallel but otherwise in random arrangement.

Testing instruments for yarns and fibres, W. S. Denham and T. Lonsdale (*Jour. Sci. Instruments, 5 (1928), No. 11, pp. 348–354, figs. 5*).—A ballistic instrument for measuring the work done in breaking a thread or bundle of filaments and an extensometer giving load-extension diagrams of single ultimate filaments of silk are described as designed in the laboratory of the British Silk Research Association.

Some measurements of the transmission of ultra-violet radiation through various fabrics, W. W. Coblentz, R. Stair, and C. W. Schoffstall (*[U. S.] Bur. Standards Jour. Research, 1 (1928), No. 2, pp. 105–124, figs. 2*).—Measurements were made of the transmission of ultra-violet and visible radiation through fabrics composed of cotton, silk, rayon, linen, and wool, the source of radiation being a quartz mercury arc lamp. See also earlier notes (E. S. R., 58, p. 94).

Examination of fabrics of close-weave and open-weave (twill, satin, voile) material gave results in agreement in showing that, comparing materials having the same weight, practically no difference exists in the amount of ultra-violet transmitted through bleached samples of cotton, linen, viscose rayon, and cellulose acetate rayon. Fresh, white, natural silk was nearly as transparent as bleached cotton, whereas wool was only about half as transparent to ultra-violet solar radiation as such cotton. In all cases when the fabric was dyed, or slightly yellowed with age, the ultra-violet transmission through the thread was greatly decreased. Hence, in comparing various kinds of dyed fabrics, the one having the largest openings between the threads transmits the most ultra-violet.

Data are also recorded on transmission of radiation through feathers and animal tissue.

MISCELLANEOUS

Forty-first Annual Report of the Pennsylvania Agricultural Experiment Station, [1928], [R. L. Watts] (*Pennsylvania Sta. Bul. 230 (1928), pp. 56, figs. 16*).—This bulletin discusses briefly the work of the station for the year ended June 30, 1928, including a financial statement for this period. The experimental work recorded and not previously noted is for the most part abstracted elsewhere in this issue. Data on the use of labor-saving machinery in vegetable gardening are also briefly reported.

[Report of West Virginia Station, 1925–1927], H. G. Knight (*W. Va. State Bd. Control Rpt., 9 (1925–1927), pt. 2, pp. 107–131, pls. 6*).—This contains the financial reports for the fiscal years ended June 30, 1925, June 30, 1926, and June 30, 1927, and reports of the director and State Board of Control on the work and publications of the station during this period.

Available publications (*New York State Sta. Circ. 105 [1928], pp. 7*).—The station publications available for distribution, arranged according to subjects, are listed.

NOTES

Arkansas Station.—Sets of experimental and farm buildings are nearing completion at the Hope, Stuttgart, and Marianna Substations. Approximately $30,000 is being expended at each substation to complete the physical plant necessary to house the livestock and farm machinery and to provide the necessary facilities for experimental and executive work. The improvements include electricity, plumbing, heating, and sewage disposal plants, the necessary administrative and experimental buildings, and housing facilities for the assistant director, foreman, and farm labor. The buildings were planned and constructed under the supervision of the department of agricultural engineering.

Dr. Edgar C. Tullis has been appointed assistant plant pathologist in the station. His work will be in cooperation with the U. S. D. A. Office of Cereal Crops and Diseases and will be confined principally to rice diseases, including studies of stem rot and straight head.

John C. Dunegan, who has been in charge of the field headquarters of the orchard spraying investigations of the U. S. Department of Agriculture at Fort Valley, Ga., for the past seven years, has established field headquarters with the department of plant pathology, whose research laboratories have been made available for the investigation of apple and peach diseases in the Ozark Region and the development of new types of sprays.

California University and Station.—C. B. Hutchison has been appointed director of the Giannini Foundation of Agricultural Economics, professor of agriculture, and associate director of research in the station. A. W. Farrall, junior agricultural engineer at Davis, has resigned effective January 1 to engage in commercial work.

Idaho University and Station.—The College of Agriculture has the largest enrollment in its history. The registration indicates an increase of 26 per cent over the previous year and the freshman class an increase of 50 per cent.

A steer feeding experiment is being conducted at the Caldwell Substation to ascertain the value of cull beans and potatoes for fattening cattle for market. Similar studies of these materials are also being carried on at Caldwell and Moscow with nearly 1,000 lambs.

Dr. E. M. Gildow, assistant professor of poultry husbandry and assistant poultry husbandman at the New Hampshire University and Station, has been appointed associate professor of veterinary science in the College of Agriculture and veterinarian in the station, and assumed his new duties late in November, 1928.

Iowa College and Station.—The new $500,000 dairy industry building was formally dedicated November 14, 1928. It consists of a main structure 205 by 64 ft., with two stories and basement and two wings each 40 by 200 ft. and one story in height. The construction is of Bedford stone and brick.

The top of the main building is devoted entirely to dairy research and dairy bacteriology. The second floor is given over to classrooms, a farm dairy laboratory, milk testing laboratories, and offices. The lowest floor is devoted to a dairy engineering research laboratory, reading rooms, and supply and storage rooms.

The wings are to be used entirely for manufacturing. Two of them will be for cheese and one each for condensed and powdered milk, market milk, butter, and ice cream. Two compressors of 10 and 6 tons capacity, respectively, will furnish refrigeration for the various manufacturing laboratories, which will be used throughout the year for instruction and research.

Kansas Station.—A hard red winter wheat research conference to consider ways and means by which research relating to problems of the grower of hard red winter wheat may be made more effective and more nearly adequate was held at the station November 8, 1928. Representatives of the stations, the grain, milling, and baking trades, various railroads, State boards of agriculture, crop improvement associations, and the U. S. Department of Agriculture and farmers of the States of Kansas, Nebraska, Colorado, Oklahoma, and Texas to the number of nearly 200 were present.

The program committee reported that there is an urgent need for a larger research program relating especially to soil and soil management, insect and disease control, lodging and shattering, cereal chemistry, certain economic problems having to do with storage and credit, and such agricultural engineering problems as removal of excess water from wheat on the farm, the size and type of bins for storage, and mechanical and power requirements in the preparation of the ground and harvesting. It was estimated that about $300,000 of additional funds would be required to put this program into effect. The finance committee recommended that the advantages of research and the need for more adequate financing of research projects be brought to the attention ot the State legislatures and the Congress of the United States. It was recommended that interested agencies join in a request for $150,000 to be added to the appropriation of the U. S Department of Agriculture for research work relating to the above problems, and also that they lend every possible assistance to the agricultural colleges and experiment stations of the five great hard red winter wheat producing States in securing additional appropriations. Provision was made for the organization of a permanent research conference made up of a general committee of representatives of the allied industries, the experiment stations of the five States, and the Department.

Maryland University.—Dr. Lewis W. Erdman, professor of soils, has resigned to engage in commercial work.

Massachusetts College.—R. W. Donaldson, an assistant county agent, has been appointed extension specialist in agronomy vice J. P. Helyar, resigned to engage in commercial work.

Michigan College.—A new dairy barn is nearing completion. This barn is constructed in the form of a letter H, with the main portion 213 by 38 ft and the wings each 112 by 38 ft. About 100 animals can be accommodated, and these will be restricted to cattle free from all symptoms of contagious abortion as shown by tests. Aside from the station herd, all other animals will continue to be housed in the old barn.

A milk room and a new bull barn are also being constructed.

Oklahoma College and Station.—C. P. Blackwell, agronomist of the soil improvement committee at Shreveport, La., has been appointed dean of the College of Agriculture and director of the station and has entered upon these duties.

Tennessee University.—An auditorium to cost $600,000 is projected, to be built on land owned jointly by the university and the city of Knoxville, and the cost of erection to be shared by the university, the city, and the county. According to a recent note in *Tennessee Farmer*, participation by the university has been approved in principle by the board of trustees.

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EXPERIMENT STATION RECORD

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A recent publication by the U. S. Department of Agriculture is of unusual appeal to all who are interested in the development of agricultural education. This is a monograph of over 200 pages from the pen of Dr. A. C. True, entitled A History of Agricultural Extension Work in the United States, 1785–1923. It is the first to appear of a projected series of monographs dealing with the history of agricultural education in the United States. In late years Dr. True has largely devoted himself to the preparation of this series, and there will be general agreement with the view expressed in its foreword by Dr. C. B. Smith that "in making permanent the records of the history and development of agricultural teaching, research, and extension work in the United States, in this and other volumes, Dr. True has rendered a high universal service."

Dr. True's unique qualifications as an authoritative historian of the extension movement rest in part upon the fact that he was responsible for the administration of the cooperative agricultural extension act, generally known as the Smith-Lever Act, from the time of its passage in 1914 to 1923. As Dr. Smith points out, "this was a formative period in popular education for rural people, in which Federal, State, and county Governments cooperated with farming people in planning the improvement of farm and home practices and rural community life. In this work, in which governments and people counseled together and financed and directed a common enterprise, many varied problems arose as to relationships, responsibilities, and policies. These Dr. True, as director of the Federal extension service, handled with wisdom, tact, and vision. From his 10 years of service in this field has come a new and efficient educational system, due in no small part to his wise guidance."

One especially valuable function which the extension monograph has ably fulfilled has been in locating, assembling, and digesting the widely scattered and difficultly available original material. An appended bibliography lists no fewer than 284 references, and many of these are to a series of publications, so that the total is even more impressive. Of these references nearly 200 antedate the Smith-

Lever Act, and a considerable number deal with matters associated with the little-known early days.

The beginnings of extension work in agriculture are located by Dr. True in the activities of some of the early agricultural societies, commencing approximately with the organization of the Philadelphia society in 1785. These societies were formed primarily to acquaint their members with what was being done to improve agriculture, but they also had among their objects the formation of local groups of farmers for mutual betterment. Thus in 1792 the Massachusetts Society for Promoting Agriculture recommended regional meetings of its members with the assistance of others "who are desirous of forwarding improvements in agriculture." The same society in 1812 sent out 1,000 copies of a letter to stimulate farmers in these directions, and in 1818 published an enlightening address by Mr. John Lowell before the Brighton fair. Speakers were likewise supplied at an early date to farmers' clubs in New York by the Society for Promoting Agriculture, Manufactures, and Arts, among them being Prof. Mitchill of Columbia University, who spoke on the relation of chemistry and other sciences to agriculture.

Itinerant lectures were begun by the New York State Agricultural Society in 1843 and in Maryland in 1848. Mention may also be made of the series of weekly meetings started in 1839 in the hall of Massachusetts House of Representatives for the purpose of discussing agricultural questions. These meetings were inaugurated by members of the legislature organized as the Legislative Agricultural Society, but were open to and participated in by the public. Among the early speakers was Hon. Daniel Webster, who compared the agriculture of England with that of Massachusetts, and Prof. Benjamin Silliman of Yale College, who emphasized the importance of chemistry in relation to agriculture.

Large prominence is given in the monograph to the work of the farmers' institutes. In Massachusetts this idea was advocated as early as 1853, when President Edward Hitchcock of Amherst College drew attention to the "great and salutary influence" on education then being exercised by the teachers' institutes and argued for a similar opportunity for farmers. Ten years later the State Board of Agriculture began its practice of holding an annual meeting for discussions and lectures with a notable gathering at which, among others, Prof. Louis Agassiz of Harvard University lectured on cattle breeding and on the work performed by glaciers in preparing the soil of temperate regions for cultivation, and Prof. S. W. Johnson of Yale discussed the application of manures.

About the same time similar work began in Connecticut and not long afterward in Kansas, Illinois, Missouri, Iowa, and elsewhere. Between 1880 and 1890 farmers' institutes or equivalent meetings were established on a more or less public basis in 26 States. During the ensuing decade State aid was secured in increasing measure, a more standardized organization and program was developed, and an increasing participation and influence on the part of the staffs of the growing agricultural colleges became apparent. The national significance of the movement was recognized with the formation of the American Association of Farmers' Institute Workers in 1896, and the appointment within the Office of Experiment Stations of a farmers' institute specialist in 1903.

In the period from 1900 to 1915 the farmers' institutes, favored with increasing State and Federal aid and with wide popularity among farming people, broadened their work and extended their influence. With the passage of the Smith-Lever Act, however, their status became radically changed and a decline set in. "The Federal authorities charged with the administration of that act discouraged the use of Smith-Lever funds for the ordinary type of farmers' institutes. The agricultural colleges receiving the benefits of that act withdrew from the institutes features which had definite educational value, such as field demonstrations, movable schools, women's institutes, and boys' and girls' clubs. State legislatures, having undertaken to support the Smith-Lever work, were not inclined to continue substantial financial support to the institutes." State departments of agriculture transferred their emphasis from educational to regulatory and statistical functions, and their gradual withdrawal from the management of farmers' institutes resulted. Whereas in 1914 about 9,000 institutes of all kinds were held in 44 States with an attendance of over 3,600,000, by 1918 the number had decreased to about 7,000 in 31 States with an attendance of less than 2,000,000, and in 1924 something over 3,500 institutes were held in 21 States with an attendance of about 1,475,000.

Full recognition is given to the important results which may fairly be credited to the institute movement, and the following summary presented in 1912 is included:

"Among the results of institute work directly affecting agricultural practice are better selection of seeds; proper use of fertilizers for various crops; use of lime and phosphate rock; better methods of cultivation; soil and moisture conservation; use of alfalfa, cowpeas, soy beans, scarlet clover, and other forage plants; growing of potatoes and crops suitable for canning; diversification and rotation of crops; control of fungus diseases and insect pests by spraying; renewal of old and neglected orchards; building of silos; growing of well-bred animals; weeding out of unprofitable dairy cows; use of the balanced ration; better sanitary arrangements in stables; prevention of tuberculosis; establishment of cheese factories; poultry husbandry; better shoeing of horses; use of concrete in farm buildings; and change from grain farming to dairy farming. Results of more general character were also reported, such as the arousing of farmers to the possibilities of intelligent effort in improving their farms; the bringing of young people to respect agriculture as a profession; the reaching of illiterate farmers; the stimulation of interest in scientific farming; the organization of farmers' clubs, cooperative associations, cow testing and breeding associations; the improvement of roads, farm homes, schools, and school buildings; and the development of a large number of capable agricultural lecturers and teachers. The farmers' institutes demonstrated the great importance and value of carrying information to the farming people through personal activities of intelligent agents. They thus helped to lay the foundations for a still broader and more effective system of popular education outside the schools and colleges, later developed by the farmers' cooperative demonstration work and the extension work of the agricultural colleges."

The monograph makes clear that along with their participation in farmers' institutes, the agricultural colleges soon undertook various forms of extension work independently. In this field they were influenced by two movements for supplementary education of adults. actively promoted during the latter part of the nineteenth century, the Chautauqua system for home reading and instruction by correspondence and "university extension," started in England in 1866. Mention is made of the agricultural extension work begun by Rutgers College in 1891 with short courses in soils and crops, feeding plants, and animal nutrition, the Chautaqua course in home reading organized by the Pennsylvania State College in 1892, and the early beginnings at Cornell University, where a State appropriation was secured in 1897 to be used in giving "instruction by means of schools, lectures, and other university extension methods or otherwise."

As the extension work of the agricultural colleges increased in scope, a special officer at the college to care for its interests became necessary. Illinois, Ohio, Iowa, and Indiana were among the pioneers in this field. In 1905 a standing committee on extension work was set up by the Association of American Agricultural Colleges and Experiment Stations, and two years later this committee reported that extension work was being carried on by 42 institutions in 39 States, of which about one-third was included in enterprises not connected with the farmers' institutes.

Interest in the development of organized extension work through the colleges grew rapidly. After some discussion the association recognized in 1908 its importance by establishing a section of extension work. By 1910 extension departments had been organized in 35 institutions and 32 States and partially organized in 3 others.

The full-time personnel had risen to 113, and 189 others were giving part time to the work. Funds amounting to about $400,000 per annum were then available.

Between 1910 and 1914 the work increased in extent and complexity and presented many important problems of organization and administration. In 1913 its funds had risen to $990,504, of which $663,310 came from State appropriations and $160,404 from local contributions. Forty institutions had definitely organized extension departments, and in 31 of these institutions 182 full-time workers were employed. A general realization of the desirability of clear differentiation from research and resident instruction phases was also developing.

Two other important elements destined to affect profoundly the development of a unified and national system are taken up in considerable detail. These are the farmers' cooperative demonstration work begun in 1904 in the South by Dr. Seaman A. Knapp and the farm management extension work carried on in a number of Northern and Western States, beginning in 1906.

Concerning the first of these, it is pointed out that "at the outset the farmers' cooperative demonstration work was exclusively a Federal enterprise and was developed through a highly centralized organization. . . . While there was considerable informal contact with the State agricultural colleges and experiment stations, definite cooperative relations with these institutions did not come about immediately. The colleges and stations, on the one hand, did not look with favor on extension work in their territory, planned without their advice and carried on by the Department. They also objected to the linking of extension work with State departments of education or agriculture. The demonstration organization, on the other hand, feared that the colleges might be influenced too much by theoretical knowledge and in some cases might demand changes in the plan of work laid down for the agents. These attitudes resulted in unfortunate situations which might have been avoided had there been more sympathetic relations between the two agencies. As the demonstration work proved successful and increased in variety and scope, particularly after the introduction of the boys' and girls' clubs with definite educational features, the agricultural colleges were led to take a more active interest."

Dr. True goes on to say that "the immediate success of the farmers' cooperative demonstration work was due in large measure to the unusual personality of Seaman A. Knapp. To his broad educational outlook, his practical experience in agricultural affairs, and his intimate knowledge of economic and social conditions in the

South were joined a profound sympathy with the heavily burdened people on the farms and his great ability to bring people of all classes to his way of thinking by persuasive conversation and eloquent public address. His clear, definite, and limited program appealed strongly to farmers and business men alike. . . . The movement had . . . many of the elements of a crusade to deliver southern agriculture from disaster. . . .

"Aside from the conditions which made the demonstration system peculiarly applicable to the then-existing situation in southern agriculture and country life, it brought to light certain fundamentals which permanently enriched agricultural extension work. The most important of these contributions were (1) the emphasis laid on the active participation of the farming people in demonstrations conducted for their benefit and (2) the establishment of the county agent system, under which farming people make use of trained official helpers permanently located near them, from whom they may receive the useful knowledge possessed by these agents and also instruction from the institutions which the agents represent."

In the Northern and Western States farm management extension developed under various auspices and organizations. There was greater diversity as to origin and evolution, and the monograph attempts few generalizations. As in the South, however, there was large reliance upon the demonstration method, and in both the county was the local unit of administration. On June 30, 1914, there were about 240 counties in 27 Northern and Western States in which agricultural agents had been at some time employed. In the 15 Southern States on the same date 1,138 men and women agents were employed in 721 counties.

During the first decade of the twentieth century, the extension work in which the land-grant colleges participated increased so rapidly in extent and variety that these institutions had great difficulty in meeting the demands upon them in this direction without impairing their resident teaching and research. A demand, therefore, arose for Federal appropriations for extension work. This wish was voiced in a report by President K. L. Butterfield in 1908 for the committee on extension work, in which he said in part, "there is little chance for argument upon the proposition that the organization of resident instruction in agriculture through the Morrill and Nelson Acts and the organization of research and experimentation through the Hatch and Adams Acts is chiefly responsible for the progress in agricultural education that has been made during the past few decades. It is true that a few individual States had recognized their obligations and opportunities before any of these acts were passed. But what brought these types of work into well-organized form, and what put them upon a substantial foundation, was the Federal appropriation. We can think of no argument that has ever applied or does now apply to Federal appropriations for agricultural colleges and experiment stations that does not equally apply to extension work, which is organic and vital in the development of the functions of the institutions which we represent.

"We would not advocate a large appropriation for this purpose. We would suggest that the proposed law should make an appropriation of, say, $10,000 a year from the Federal Treasury to each land-grant college for the purpose of carrying on extension work in agriculture, and that the act be so framed that after this appropriation has been made, there shall also be an appropriation, based on some per capita standard, made to the same institutions for the same purpose on condition that the States themselves appropriate equal amounts. Thus we would have effected a stimulus for well-organized extension work in every land-grant college in the United States."

Thus was initiated the campaign for Federal legislation, which after many complications and vicissitudes culminated in the adoption of the Smith-Lever Act on March 8, 1914. This act, it is of interest to note, eventually conformed essentially to the suggestions originally laid down by the committee, with the important addition of provisions for cooperative extension work between the agricultural colleges and the U. S. Department of Agriculture. In the words of the monograph, "this act established a broad national system of popular and practical education in agriculture and home economics, which may be carried on through the various agencies and methods used by the Department of Agriculture and the agricultural colleges when the act was passed or in new ways which may be devised to meet future conditions of agriculture and country life."

The first year following the passage of the act was primarily a period of adjustment, for "as is always the case with new statutes drawn for the most part in broad general terms, there were many problems of administration to be solved in putting the Smith-Lever Act into full operation." Work of the kinds contemplated by the act was being conducted by the Department, State departments of agriculture, the State agricultural colleges, and county farm bureaus or similar organizations. The State and local organizations varied widely as regards the laws, regulations, and relationships pertaining to their work, and their funds were derived from both public and private sources. While there was already considerable cooperation between the Department and county extension agencies, there were no well-defined policies for such cooperation, and there were large areas of operation and of organization in which it was functioning imperfectly, if at all.

These conditions and the resultant need for a more centralized organization and a more definite policy led to the establishment within the Department of the States Relations Service to have immediate charge through its extension offices of the Department's relations, and the creation within each agricultural college of an extension division to administer its entire extension funds in agriculture and home economics. By 1917 a strong cooperative extension organization had been established in every State. In a large way, the first three years "settled the principles and methods for the successful and permanent establishment of a national system of extension work in agriculture and home economics, in which Federal, State, and county forces were to cooperate closely and in which many thousands of farm men, women, and children were to participate."

An important section of the monograph deals with the war-time extension work of 1917 and 1918 and immediately following the signing of the Armistice. This period furnished a much heavier and more vital responsibility than had been dreamed of, and it materially affected the character of the extension work. Food production and conservation became outstanding objectives, and many new and unexpected duties devolved upon the organization. Despite an excessive turnover of competent workers and other difficulties, its sphere of influence greatly widened. The number of farmers actively cooperating in extension work increased from about 100,000 in 1915 to more than 275,000 in 1919, and the number of farm women cooperating in the home demonstration work from 6,000 to more than 125,000. The enrollment in boys' and girls' clubs during the same period rose from about 250,000 to 614,000. On June 30 1919, over 75 per cent of the counties had a county agricultural agent, and 35 per cent had a county home demonstration agent.

The period of postwar readjustments likewise presented new and serious complications. In considerable degree the educational purpose of the extension work had become supplanted during the war by various forms of service for individuals and organizations and for the Federal Government. When the war was over the economic problems of farmers became so pressing and acute that the need for this personal service continued to be felt, not only in matters relating to agricultural production but in the marketing of products. This situation led to difficulties as regards relations with commercial groups and similar bodies and ultimately to the development apart from the extension force of local farm bureaus and State and national federations thereof.

Gradually the extension services were able to resume more fully their functions as educational agencies and to build their program upon a community basis. Increased attention was given to methods of instruction and of organization. The monograph closes with the abolition of the States Relations Service in 1923 and the regrouping of the Department's extension activities into the Extension Service.

The general status and progress of the work at that time may be visualized by a few summary figures. In the nine years following the passage of the Smith-Lever Act the funds for extension from all sources had risen from $3,597.236 in the fiscal year 1915 to $18,821,144 in 1923. Slightly over one-third of this amount, or $6,953,202, represented the Federal appropriations, while from sources within the States the offsets for the Smith-Lever funds were $5,400,000, additional State and college funds $1,628,572, county funds $4,125,675, and contributions from farm bureaus and miscellaneous sources $713,695. For the maintenance of the Washington extension office about $214,000 was available, while of the funds for the States there was used approximately $1,015,000 for administration, $9,038,000 for county agent work, $3,013,000 for home demonstration work, $1,112,000 for boys' club work, $3,239,000 for extension specialists, and $504,000 for extension schools, fairs, publications, and miscellaneous. The total number of cooperative extension employees was 4,564, of whom 384 were administrative leaders, about 740 extension specialists, and over 3,400 county and local representatives. As a partial measure of their activities there may be cited the fact that in the calendar year 1922 about 885,000 demonstrations were conducted by farmers or members of their families under the guidance of the various classes of extension agents.

Nearly six years have elapsed since the date with which Dr. True's monograph is terminated. This period has likewise been eventful and important. Much progress has been made under the new plan of organization, and the financial difficulties occasioned by the steady enlargement of the system and the decreased purchasing power of the dollar have been materiallly alleviated by the enactment of the Capper-Ketcham Act of 1928. Inevitably the extension service is still facing many serious problems, but its days of pioneering have evidently passed away. Taken as a whole the movement probably represents the greatest venture undertaken anywhere or at any time in attempting to ameliorate the economic and social condition of a people along these lines. It, therefore, means much that in so short a period the work should have become so widely appreciated and so thoroughly accepted and assimilated as a potent factor in the education of the nation.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Colloid chemistry, theoretical and applied.—II, Biology and medicine, edited by J. ALEXANDER (*New York: Chem. Catalog Co., 1928, vol. 2, pp.* [2]+*1029, figs. 246*).—This volume, the second of this series (E. S. R., 55, p. 709), has been compiled from articles dealing with the phases of colloid chemistry more especially related to biology and medicine. Exclusive of the editor's preface, the volume contains 57 papers especially prepared for the purpose, and as an appendix a lecture on The Explanation of the Colloidal Behavior of Proteins by J. Loeb, whose intended article for this volume was not completed before his death.

Cataphoresis and the electrical neutralization of colloidal material, S. MATTSON (*Jour. Phys. Chem., 32 (1928), No. 10, pp. 1532–1552, figs. 8*).—Following a brief review of a number of problems in which the author considers cataphoretic investigation a means of important advances, description is given of a simple form of cataphoretic cell designed to avoid methodic errors considered to have arisen from the nature of the apparatus used. Criticism of several designs is made, the new cell being itself a modification of a design previously published (E. S. R., 48, p. 618) by the author of the present contribution.

The cell consists mainly of a thick-walled capillary tube of an inside diameter of 2.35 mm., 22.3 cm. in length, and terminating in two larger vessels. One of these is a simple short, wide tube having its walls so contracted at the base as to be continued smoothly into those of the capillary, while the other is a short, wide vessel drawn down at each end to terminate in a glass stopcock and communicating with the capillary tube midway between the two cocks. At about the middle of the capillary the thick wall is ground down to within 0.2 mm. of the inner wall to form a plane surface through which microscopic observation of the movements in the tube can be made, the plane surface being either polished or covered with a piece of thin cover glass attached with Canada balsam. At right angles with the plane through which observation is made another plane surface is ground to admit a beam of light illuminating the particles to be observed, as in the ultramicroscope illuminating system. Large platinum electrodes are placed in the end vessels, as close as possible to the ends of the capillary tube and connected with a 220-volt direct current supply through leads sealed through the glass.

This apparatus was attached to the stage of a microscope, and the observations were made at a magnification of 150 diameters. A commutator switch and a 50-watt lamp used as resistance completed the essential electrical arrangements, and illumination was obtained from a system similar to that used for the ultramicroscope.

Investigational work carried out by means of these arrangements and detailed at considerable length may in part be summarized as follows: (1) With respect to the electrical neutralization of clay suspensions by aluminum salts, the experiment showed that the products of hydrolysis of these salts rather than the trivalent cations constitute the active agent and that adjustment of the pH value to about 5.2 is essential to the highest degree of efficiency. (2) In the case of the electrical neutralization of clay by methylene blue in the presence of various anions and cations, the isoelectric ratio methylene blue : clay was increased by anions and decreased by cations with an effect increasing with the valence of the ion. (3) The quantities of methylene blue required to neutralize the electronegative proteins in milk decreased with increasing acidity of the milk, and the electrical neutralization of the colloidal materials in raw sugar and molasses indicated a proportionality between the neutralizing power and the quantities of the colloidal material present. (4) Barium sulfate was shown to be electropositive when present alone or with an excess of barium but electronegative in the presence of an excess of sulfate, the electropositive condition causing a decrease, and the electronegative condition an increase, in the pH value of the solution. The last-named effect is explained by the assumption of an adsorption of the OH and of the H ions, respectively, of the water present.

The work is a contribution from the New Jersey Experiment Stations.

The preparation of coarsely porous ultrafilters [trans. title], H. Bechhold and K. Silbereisen (*Biochem. Ztschr., 199 (1928) No. 1-3, pp. 1-7*).—Description is given of a procedure for preparing relatively large-pored collodion ultrafilter membrances, the essential modification of the method consisting in the coagulation of the film of glacial acetic acid-collodion in an acetic acid solution containing 18 per cent or more of water, rather than in water alone. The membranes obtained were denser in proportion as the dilution of the acid in which the coagulation took place was increased. By varying the concentration of the glacial acetic acid collodion solution and the water content of the acid in which the films were hardened, it was found possible to produce ultrafiltration membrances of any desired degree of porosity. The possibilities of the modified method are briefly discussed.

The relation of the growth of certain micro-organisms to the composition of the medium, I–III, V. Reader (*Biochem. Jour., 21 (1927), No. 4, pp. 901–912, fig. 1; 22 (1928), No. 2, pp. 434–439*).—Three papers are presented.

I. *The synthetic culture medium* (pp. 901–907).—The first of these papers deals with the basal food requirements of three microorganisms, *Sarcina aurantiaca*, *Streptothrix corallinus*, and a white Streptothrix. The optimum conditions for growth were an H-ion concentration of pH 7.4, a salt mixture consisting of $(NH_4)_2SO_4$ 0.30 gm., $MgSO_4$, $7H_2O$ 0.07, KH_2PO_4 0.10, K_2HPO_4 0.016, NaCl 0.05, and $Ca(NO_3)_2$ 0.04 gm. in 100 cc., and a concentration of glucose of 0.5 per cent. Under these conditions it was found that traces of manganese or iron did not increase the rate or amount of growth, and that glucose might be replaced by glycerol, mannitol, arabinose, lactate, citrate, pyruvate, or glycogen. Amino acids did not supply an improved source of nitrogen, ammonium salts proving more effective. In all cases it was found possible to obtain marked improvement in the rate of growth by adding minute quantities of broth or other bios-containing substances.

II. *The effect of changes of surface tension on growth* (pp. 908–912).—In the second paper evidence is presented that the growth-promoting activity of broth or antineuritic vitamin concentrates for *S. corallinus* is not due to a lowering of the surface tension of the medium.

III. *The effect of the addition of growth-promoting substances to the synthetic medium on the growth of Streptothrix corallinus* (pp. 434–439).—This paper reports a systematic study of the nature of the substance or substances in broth which have been found to stimulate the growth of *S. corallinus*. With the synthetic medium prepared under the optimum conditions described in the first paper, a standardized beef broth, 1 cc. of which represented 0.5 gm. of fresh heart muscle, was found to promote fair growth in a 1:2,000 concentration of the synthetic medium and vigorous growth at a concentration of 1:400 or above. Broth kept at room temperature for two days lost some of its activity, but kept in the laboratory at pH 6.5 for three months retained its activity. The growth-promoting factor was soluble in water, insoluble in ether, and dialyzable through collodion sacs. It was partially but not entirely destroyed at the charring temperature 170° C., was not precipitated by either neutral or basic lead acetate, and was not recoverable either in the precipitate or filtrate from mercuric chloride.

Tests of other materials for the presence of the growth-promoting factor showed its presence in yeast preparations, rabbit muscle, serum, and wheat embryo. Unlike the antineuritic vitamin, it appeared to be stable to alkali. An extract which had an activity for pigeons of 0.2 mg. per day retained its activity for *S. corallinus* after boiling with N/4 sodium hydroxide for 60 minutes.

Streptothrix corallinus in the estimation of vitamin B₁, J. ORR-EWING and V. READER (*Biochem. Jour.*, 22 (*1928*), *No. 2*, *pp. 440–442*).—With certain limitations the growth-promoting properties of antineuritic vitamin concentrates for *S. corallinus*, as noted in the above paper, have been found to be a reliable index of the concentration of this vitamin. The method consists essentially in comparing the amount of growth, as measured by the turbidity of the suspension in known dilutions of the concentrate being tested, with the growth in graded concentrates of a standard torulin, the pigeon dosage of which is known. Two sources of error are recognized in the use of the method in following the fractionation of the antineuritic vitamin, (1) the growth of the organism is markedly retarded by certain reagents used in the extraction process, particularly mercury, silver, and platinum salts; (2) an abnormally rapid falling off of growth may occur as the dilution is increased. Both of these can be detected by observing the growth in the standard flask of highest concentration, which will show poor growth in the first instance and give results inconsistent with succeeding dilutions in the second. These anomalous results have thus far been obtained only with fractions before the charcoal adsorption stage.

Note on the Meningococcus as a source of the growth factor for Streptothrix corallinus, J. ORR-EWING and V. READER (*Biochem. Jour.*, *22* (*1928*), *No. 2*, *pp. 443, 444*).—Evidence is presented briefly that a strain of Meningococcus Type I is capable of growing rapidly upon a meat extract medium which has been completely freed from *S. corallinus* growth factor by charcoal extraction, and that following the growth of Meningococcus in this medium *S. corallinus* is able to grow in the same medium, thus indicating that the Meningococcus in its growth has synthesized the growth factor for *S. corallinus*. It is noted, however, that the degree of *S. corallinus* growth falls off more rapidly than is warranted by the dilution of the medium, and consequently the claim cannot be made that the Meningococcus is capable of synthesizing the antineuritic vitamin.

The relation of vitamin B₁ to the growth-promoting factor for a Streptothrix, R. A. PETERS, H. W. KINNERSLEY, J. ORR-EWING, and V. READER (*Biochem. Jour.*, *22* (*1928*), *No. 2*, *pp. 445–450.*)—In an effort to determine the relationship between the antineuritic vitamin and the *S. corallinus* growth factor, parallel tests have been made upon the pigeon and *S. corallinus* during the course of numerous fractionations of yeast concentrates and the results have been reported in terms of pigeon units.

Excluding the tests which gave the anomalous results noted previously, the only differences in the results with the two tests have been the greater stability to alkali of the *S. corallinus* factor and an occasional regeneration of activity after treatment with phosphotungstic acid.

The authors conclude that the curative factor for pigeons is not identical in all respects with the growth-promoting factor for *S. corallinus*. The fact that the most active antineuritic fractions still promote the growth of *S. corallinus* and that the effect is quantitatively the same as that of preparations which are many times less pure is thought to suggest the possibility that the same nucleus may be involved in each case, some change making the factor unavailable for the pigeon but not for the bacillus.

The synthesis of 3:4-dihydroxyphenylalanine, C. R. Harington (*Biochem. Jour., 22 (1928), No. 2, p. 407*).—The author's attention having been drawn to some difficulties encountered by others in attempting to carry out certain steps of his recently noted synthesis of 3:4-dihydroxyphenylalanine (E. S. R., 59, p. 802), he now presents an improvement in the preparation from the azlactone resulting from the condensation of vanillin with hippuric acid of the intermediate ethyl benzoylamino-3-methoxy-4-hydroxycinnamate.

Dissolve 10 gm. of the azlactone in 100 cc. of alcohol and add 10 cc. of concentrated sulfuric acid, boiling the mixture under a reflux condenser for 20 minutes. Distil off under diminished pressure about three-fourths of the alcohol, keeping the bath temperature below 40° C. No discoloration should occur at this stage. Pour the residual yellowish sirup into a dish and rub it up with cold water with the addition of sodium bicarbonate sufficient to neutralize the sulfuric acid and to render the solution slightly alkaline. Take up the oily ester in ethyl acetate and again extract the aqueous solution with the same solvent, combining, dehydrating, and evaporating the acetic ester solution. Dissolve the residue in warm alcohol and precipitate the ester by the cautious addition of water. ("It separated first as an oil which crystallized on rubbing; this crystallization is almost immediate if a trace of the substance be available for seeding.") After some hours' standing in an ice chest, filter off the precipitate and recrystallize it from 60 to 65 per cent alcohol.

"There was thus obtained 55 to 60 per cent of theoretical yield of the pure ester, melting point 129°."

A note on the crystallization of free arginine and histidine, H. B. Vickery and C. S. Leavenworth (*Jour. Biol. Chem., 76 (1928), No. 3, pp. 701–705, figs. 4*).—Pure arginine was found to crystallize in prisms of the dihydrate from water and from 66 per cent alcohol in anhydrous plates. Pure histidine crystallized both from water and from 50 per cent alcohol in thin anhydrous plates, the last-named solvent yielding much smaller crystals than the water. The methods used in crystallizing the two bases are detailed, the crystal habits of each base are described, data indicating the purity of the crystallized substances are given, and the microscopic appearance of each base, as crystallized from water and as crystallized from the respective concentrations of alcohol above noted, are shown in photomicrographs. The work is a contribution from the Connecticut State Experiment Station.

The chemical action of quinones on proteins and amino acids, E. A. Cooper and R. B. Haines (*Biochem. Jour., 22 (1928), No. 2, pp. 317–325*).—The present investigation of this reaction was undertaken primarily to throw light on the bactericidal properties of quinones, benzoquinone having shown several times the bactericidal effectiveness of toluquinone.

In the case of the reaction with amino acids, the ratios of the quantities of benzoquinone to those of toluquinone reacting under similar conditions with a number of amino acids were observed to be for glycine 1.9–4.9, alanine 3.9–6.2, *r*-leucine 2.7, *l*-leucine 0.6–2.6, tyrosine (solid) 0.7–2.1, tyrosine (dissolved in N/10 HCl) 5.8, phenylalanine 6.0, glutamic acid 4.3, asparagine 1.7–6.2, cystine (solid) 1.8, cystine (in solution) 2.4, mixture of diamino acids 1.9–7.0, tryptophan 1.5–3.0, creatine 0.5–2.4, creatinine 1.0, glycylglycine 1.1, and glycine ester-HCl 2.8. Similar comparisons were carried out also with gelatin, with edestin in sodium chloride solution, and with "albumin."

In conclusion it is stated that (1) quinones readily decompose in aqueous solutions under the influence of light, the change being accompanied by a fall in bactericidal power. (2) Benzoquinone is from 4 to 17 times more active as a germicide than is toluquinone, the exact ratio depending upon the experimental conditions, although toluquinone is the more diffusible through a membrane and the more readily adsorbed by colloids. (3) The bactericidal effectiveness of benzoquinone is increased by alcohol much more than is that either of phenol or of toluquinone, and the initial stages of the reaction of benzoquinone with glycine are greatly accelerated by alcohol. (4) "Whilst there is relatively only a small difference in the apparent reactivity of the quinones toward yeast, bacteria, proteins, peptones, peptides, and even certain amino acids, benzoquinone reacts up to 7 times as readily as toluquinone with other amino acids. (5) Toluquinone is adsorbed to a somewhat greater extent than benzoquinone by charcoal and desamino-albumin. The difference, however, is not sufficiently great to justify the conclusion that adsorption is the primary factor in the protein experiments, and the evidence points to the conclusion that the small differences in the uptake of benzoquinone and toluquinone by proteins have a structural explanation. (6) The germicidal power of the quinones is not necessarily due to their chemical interaction with the cell-proteins, but is to an important degree associated with their reactivity toward the simpler cell-constituents, such as certain of the amino acids."

Modifications of the method for the determination of the basic amino acids of proteins: The bases of edestin, H. B. Vickery and C. S. Leavenworth (*Jour. Biol. Chem.*, *76* (*1928*), *No. 3*, *pp. 707–722*).—For the purposes of the simplification of the analysis and the simultaneous improvement of its accuracy, the separation of the histidine from the arginine, here reported from the Connecticut State Experiment Station, is made by bringing the solution to pH 7.0 after treatment with silver oxide in the presence of sulfuric acid. The arginine salt of silver is soluble under these conditions, while that of histidine is completely precipitated. The final determination of these two bases consists in the weighing of their dinitronaphtholsulfonates (flavianates), while lysine is determined in the usual way as the picrate. "Throughout the procedure silver nitrate is replaced by silver oxide, which is added to a solution maintained acid with sulfuric acid. The troublesome washing necessitated by the presence of the nitrate ion is thereby avoided.

"Present experience indicates that when analyses are carried out with 50-gm. samples of protein, the proportions of the three bases indicated by the weights of their respective salts are approximately 90 per cent of the proportions which are found when a much larger sample of the protein is analyzed. It therefore seems justifiable to increase the proportions so found by one-ninth. A large scale analysis of edestin indicates that this protein yields 2.08 per cent of histidine, 15.8 per cent of arginine, and 2.19 per cent of lysine."

It was further found that "the unexpected high solubility of arginine phosphotungstate is not due to a partial racemization, as the arginine recovered from a phosphotungstate filtrate possesses normal optical activity."

The estimation of amino acid nitrogen in animal tissues, J. M. LUCK (*Jour. Biol. Chem.*, 77 (*1928*), *No. 1, pp. 1–12*).—The procedure is as follows:

Drop into liquid air in a mortar an excised sample of about 4 or 5 gm. of the tissue and powder this sample finely. Weigh out rapidly a 3-gm. portion of the powder to the nearest milligram, using a small weighing bottle. Transfer the material by means of 30 to 35 cc. of boiling 0.01 N acetic acid used in 5 or 10 cc. portions quantitatively to an 8 by 1 in. tube, and graduate to 50 cc. Promptly immerse the tube in a water bath and let it come to the boiling point, shaking the tube occasionally. Remove the tube from the bath after 7 minutes' boiling and permit it to cool. Add 3 cc. of 50 per cent trichloroacetic acid, and make up the volume accurately to 50 cc. with water. Mix the suspension thoroughly and allow it to stand 30 minutes, then add 2 gm. of infusorial earth, shake the mixture vigorously, and filter. Evaporate 35 cc. of the filtrate in a 100-cc. beaker over a free flame or on a hot plate to about 10 cc. Add 10 per cent of sodium hydroxide until the solution is alkaline to phenolphthalein, from 10 to 20 drops usually being required. Continue boiling the alkaline solution for 2 minutes. Acidify with an excess of glacial acetic acid and carefully continue the concentration to a final volume of about 1 cc. Wash this residue into the Van Slyke apparatus (E. S. R., 26, p. 22) for determination of the amino nitrogen.

It is noted that in addition to the advantage of rendering the material sufficiently brittle to permit of pulverization, the liquid air treatment rapidly lowers the temperature to a point at which post-mortem changes "proceed immeasurably slowly," and also destroys the cells by the freezing and thawing. The value of trichloroacetic acid as protein precipitant for the deproteinization of such extracts as are here obtained is also discussed in comparison with the properties of other precipitants commonly employed.

The estimation of the diamino-nitrogen in the products of hydrolysis of proteins, J. C. KERNOT and J. KNAGGS (*Biochem. Jour.*, *22* (*1928*), *No. 2, pp. 528–534, figs. 2*).—The results and conclusions here presented were secured in an experimental study of the discrepancies observed in the use of the protein analysis method of Van Slyke (E. S. R., 26, p. 22), and usually attributed to factors involved in the precipitation and treatment of the phosphotungstates of the "hexone" bases. A brief review of the published work on the subject notes the opinions reached by a number of previous investigators.

The present experiments were carried out with ossein, with the gelatin derived from it, and with dried codfish skins as the protein materials. The experimental variation in the conditions of the determination consisted in the application of a number of modes of hydrolysis of the protein sample, changes in the total concentration of nitrogen present in the solution for precipitation, and in precipitating (1) at 20° C. with filtration and washing after 24 hours, and (2) at 100° with 24 hours' standing at laboratory temperature, followed by filtration and washing with a fixed volume of wash solution. Graphs illustrating the general indications of the data are shown.

In conclusion it is stated that the percentages of nitrogen precipitated by phosphotungstic acid from the hydrolysis products of protein depend upon (1) the concentration of nitrogen in the solution, (2) the temperature of the solution, both at precipitation and during the subsequent settling period, (3) the concentration of the acid used in the hydrolysis of the protein, and (4) the time during which the protein is in contact with the cold acid before heating for hydrolysis.

Convenient and rapid microanalytical tobacco investigation methods.—I, The microtitrimetric determination of nicotine [trans. title], J. Bodnár, J. Straub, and V. L. Nagy (*Biochem. Ztschr., 195 (1928), No. 1–3, pp. 103–117*).—A sample of 1 gm. of tobacco powder is weighed into a dry powder bottle of 50-cc. capacity and provided with a well-fitting stopper. One cc. of a mixture of 3 parts of 33 per cent sodium hydroxide solution and 1 part of alcohol is then added and well mixed with the sample by means of a glass rod, after which 10 cc. of ether and 10 cc. of petroleum spirit are run in and well shaken. It is considered that in the case of tobaccos of low nicotine content (1 to 2 per cent) extraction may be complete in one-half hour, and that in the case of tobaccos of higher nicotine content the entire quantity will be dissolved in from one to two hours. An extraction period of two hours is regarded as safe in any case.

After extraction the yellow-colored ether-petroleum spirit solution is filtered quickly into a dry flask, 10 cc. is rapidly pipetted into a dry 100-cc. Erlenmeyer flask, ammonia is removed by means of a stream of air in the usual way, and there are then added 10 cc. of water, 10 to 15 cc. of $N/_{100}$ hydrochloric acid, and a small drop of methyl red solution, after which the mixture is titrated back with $N/_{100}$ sodium hydroxide to a yellow color. For convenience in calculating the result, it is noted that one-fifth of the observed quantity of nicotine, expressed in milligrams, gives the percentage of the base in the tobacco under investigation.

Tabulated data obtained in tests of the method, made with 20 varieties of tobacco and in comparison with a gravimetric method, show close agreement among the results of the volumetric method, and a difference between these figures and those given by a gravimetric method averaging less than 0.1 per cent.

The influence of sodium fluoride and thymol on the determination of urea by the urease method, A. E. Osterberg and E. V. Schmidt (*Jour. Biol. Chem., 76 (1928), No. 3, pp. 749–754*).—The use of sodium fluoride and thymol in the proportions 10:1 and in the concentration of 10 mg. or more per cubic centimeter of the blood to be preserved was found to result in the retarding of the conversion of urea into ammonium carbonate by urease.

"Urea when added to either water or blood can not be recovered quantitatively by the Van Slyke and Cullen procedure in the presence of sodium fluoride. If a longer period of incubation is used the urea values approximate more closely their true value. This procedure, however, is not recommended."

Preliminary investigations on the constitution of the hemicelluloses of timber, M. H. O'Dwyer (*Biochem. Jour., 22 (1928), No. 2, pp. 381–390*).—Report is made of a preliminary investigation into the constitution of the hemicelluloses of timber as represented by the substance designated "hemicellulose A" obtained in a manner detailed in a previous communication (E. S. R., 56, p. 10) from beechwood and from American white oak. "Some idea of the complex nature of these investigations may be gathered from the fact that the acetates obtained contain apparently three different substances."

Of the hemicellulose A from beechwood 80 years old, 80 per cent could readily be acetylated, while of the substance of the same designation as obtained from an older beech and from oak heartwood but 20 per cent was acetylated under the same conditions. It is concluded that the nature of the hemicelluloses is apparently dependent upon the age of the wood. The hemicelluloses both from beech and from oak contained methoxyl, of which about one-half seemed to be present in the ester form of combination. The remainder "resists drastic methods of de-esterification."

Methylation of the acetylation residue was carried out in the case of the oak wood hemicellulose with the result that a considerable rise in the methoxyl content was observed, and the significance of this fact as supporting the idea of the presence of unsubstituted hydroxyl groups is noted. "This . . . was accompanied by a large increase in ash after re-methylation of the substance, due to the formation of a sodium compound."

Studies on pectin.—II, The estimation of the individual pectic substances in nature, D. R. NANJI and A. G. NORMAN (*Biochem. Jour., 22 (1928), No. 2, pp. 596–604*).—This article presents a procedure based upon principles formulated by Carré and Haynes (E. S. R., 47, p. 610). "It is proposed eventually to follow by this method the regional and seasonal changes in some selected types of plant or plants, at the same time proceeding with histological investigations on the same material." The procedure detailed may be thus summarized:

Extract a suitable quantity of the dried and powdered tissue for 24 hours at 85° C. with about 200 cc. of the extracting solution (0.5 per cent aqueous ammonium oxalate or aqueous oxalic acid of the same concentration). Filter and wash the residue with more of the solvent, making up the filtrate and washings to 250 cc. Concentrate carefully 100 cc. of this extract on a hot plate to about 25 cc. If oxalic acid has been used as extracting solution, neutralize the acid exactly before concentration to avoid hydrolysis. Cool and add 3.5 volumes of 95 per cent alcohol containing 5 or 6 drops of the concentrated hydrochloric acid. "The final concentration of alcohol should be not less than 70 per cent, and should be kept the same in all estimations." Allow the precipitate to stand several hours, then filter on a fluted paper and wash with acid alcohol until the washings show no further trace of oxalate. Place the filter paper and precipitate in a beaker and dissolve the precipitate by boiling with from 40 to 50 cc. of distilled water. (In the case of ammonium oxalate extracts use very dilute ammonia.) Filter off the solution and again boil the paper on which the alcohol precipitate was collected, using this time dilute ammonia in the case of aqueous or oxalic acid original extracts and water in the case of ammonium oxalate extracts. Finally add a further quantity of water to the boiled filter paper, triturating with a glass rod and boiling. Filter and wash with hot water and with hot dilute ammonia. Treat the combined filtrate and washings, "usually a little over 100 cc.," with 100 cc. of 0.4 per cent sodium hydroxide and allow to stand overnight. Precipitate the pectin by adding 50 cc. of normal acetic acid and an equal volume of 11.1 per cent calcium chloride solution, and boil for at least 5 minutes. Filter as hot as possible through a tared filter paper, wash the calcium pectate gel free from chloride. Dry the precipitate at 100° and weigh.

Results obtained by this method in the cases of some leaves, cereal grains, and fruits are given.

METEOROLOGY

Climatic cycles and tree-growth.—Volume II, A study of the annual rings of trees in relation to climate and solar activity, A. E. DOUGLASS (*Carnegie Inst. Wash. Pub. 289, vol. 2 (1928), pp. VII+166, pls. 9, figs. 19*).—Studies in continuation of those previously noted (E. S. R., 42, p. 417; 43, p. 809), especially with reference to the influence of rainfall and soil moisture on the ring growth of trees, are reported in detail with an extensive bibliography. Improvements in technique of collection and preparation of material and of new instruments used in such studies are described.

The results show that "soil moisture is a strongly controlling factor in ring-type, both in sequoia and yellow pine," indicating that "soil moisture gradient below the trees could be used as an indicator of ring characters," and confirm the relation of wet and dry climate effects to the solar cycle. "Provisional results indicate that the 11-year cycle appears in the long sequoia records at 1300 to 1100 B. C., 300 B. C., A. D. 35 to 240; 375 to 475; 600 to 650; 800 to 900 and 1250 onward, with the interruption following 1700. The dry years in the Flagstaff area tree-growth analyze best on 14 and 21 year cycles, with major droughts at about 150-year intervals and minor droughts at 40 or 50 year intervals. The extension of the cycles observed in the last 200 years in the Flagstaff area indicates possible large growth of trees in the 1930's and 1950's, with depressions in the early and late 1940's."

Climatological data for the United States by sections, [July—August, 1928] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 15 (1928), Nos. 7, pp. [196], pls. 2, figs. 3; 8, pp. [196], pls. 2, figs. 4*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for July and August, 1928.

Report on the phenological observations in the British Isles from December, 1926, to November, 1927, J. E. Clark, I. D. Margary, R. Marshall, and C. J. P. Cave (*Quart. Jour. Roy. Met. Soc. [London], 54 (1928), No. 227, pp. 203–256, figs. 7*).—Observations of the usual kind at 419 stations are reported in detail and summarized in notes and diagrams.

"Again, as so often of late years, early warmth and consequent early flowering was made disastrous by exceptional frosts in late April and May. In 1927 this was followed by continued cold and generally sunless drought, giving way in late June to an almost unprecedented period of very wet, cool, sunless weather with little break before October. For farming particularly the year was very bad, in some districts disastrous. Undoubtedly vegetable growth was abnormal, and it is possible that the October warmth and sunshine may have so ripened wood and laid the foundation for healthy buds as to have saved the situation for fruit crops in 1928 (largely frustrated for plums and pears by April frosts)."

The "sukhovey" (hot winds) of the plains of southeastern Europe [trans. title], V. O. Askinazi (W. Askinazy) (*Izv. Nauch. Melior. Inst. (Jour. Sci. Inst. Amelior.), No. 17 (1928), pp. 69–114, figs. 10; Eng. abs., pp. 113–114*).—The conditions responsible for and accompanying these hot winds and the nature of the injury to plants caused by them are explained. The injurious effect of the winds is attributed to the fact that the high temperature causes plants to give off moisture faster than they can draw it from the soil through their roots, and it is pointed out that the winds are especially disastrous when conditions are most favorable for a good crop. Three means of combating the winds are discussed, (1) irrigation, especially by spraying, (2) use of dry farming methods, and (3) selection of resistant plants.

Sun-spot numbers and annual rainfall in New Zealand, E. Kidson (*New Zeal. Jour. Sci. and Technol., 10 (1928), No. 2, pp. 90–97, fig. 1*).—A study of the relationship of annual rainfall at 47 stations in New Zealand having records covering periods of upwards of 29 years to the Wolfer annual observed sun-spot numbers indicated a higher average rainfall at sun-spot maximum and a lower average at sun-spot minimum. There were, however, wide deviations from the average due to other causes than direct sun-spot effect, and the author concludes that "the results of this investigation are likely to be of more value in the problem of seasonal forecasting, as suggesting lines of research into those fluctuations of the general circulation of the atmosphere which are responsible for the differences between seasons, rather than as a direct means of forecasting."

SOILS—FERTILIZERS

Lysimeter investigations (*New York State Sta. Rpt. 1928, pp. 18, 19*).—Continuing previous work (E. S. R., 58, p. 816), on the less productive soil barley yields following two years of alfalfa were nearly three times those of barley following two years of timothy, and even on the more productive soil the yields following alfalfa were nearly twice those obtained after two years of timothy. The maximum difference between alfalfa and timothy in the nitrogen content of the drainage water has been found to appear in the year in which the residues are incorporated into the soil rather than in the year in which the green manure crop is grown, the alfalfa rotation yielding in the less productive soil six times as much nitrogen as did the timothy, and twice as much on the more productive soil. More calcium, magnesium, chlorine, and sulfates, however, in the case of calcium about 30 per cent more, were leached from the timothy than from the legume rotation.

The buffer method and the determination of exchangeable hydrogen for estimating the amounts of lime required to bring soils to definite pH values, W. H. Pierre and S. L. Worley (*Soil Sci., 26* (*1928*), *No. 5, pp. 363–375*).—The objects of the work constituting the subject of this contribution from the Alabama Experiment Station are stated in the following terms: "(1) To work out a simple method for the determination of the buffer action of soils toward base; (2) to determine the correlation between the buffer-action of soils toward base as determined in the laboratory and the amounts of lime required to bring soils to definite pH values by liming; (3) to determine the H-ion concentration of soils limed in accordance with their content of exchangeable hydrogen." The following results were secured:

(1) It was found possible to determine satisfactorily the buffer capacity of soils with respect to base, and from the resulting figures to calculate the lime requirement to definite pH values, by placing 20-gm. samples of the soils in 150-cc. collodion sacks suspended in 150-cc. extraction flasks. Various suitable additions of 0.1 N barium hydroxide were made to a series of such bags to furnish the desired series of points to the base titration curve, after which distilled water was added in part within and in part outside the sacks in quantities sufficient to bring the total volume to 100 cc. The pH value of the clear diffusate was determined after 3 days' standing, during which time the flasks were shaken 5 or 6 times a day.

(2) It was observed that soils thus treated with base in the laboratory showed lower H-ion concentrations than did the same soils when treated with equivalent quantities of lime in greenhouse pots. "The liming factor" or ratio of lime required in the field or greenhouse to produce the pH value yielded by a given quantity of base in the laboratory was found in the case of 77 soils of widely different texture and acidity to show a noticeable uniformity with an average value of about 1.50.

(3) Liming soils according to their determined content of exchangeable hydrogen brought them to pH values of about 6.5 only, not to pH 7.0. The reason for this difference is "believed to be because the lime reacts with other than the exchangeable hydrogen of soils." The nonexchangeable soil complex is also considered responsible for the existence of the liming factor.

(4) The determination of buffer action as described and the exchangeable hydrogen determination are recommended as methods for ascertaining the quantities of lime required to bring soils to desired definite pH values. The advantages of these procedures are briefly discussed.

The identification and composition of the soil alumino-silicate active in base exchange and soil acidity, H. W. Kerr (*Soil Sci., 26* (*1928*), *No. 5, pp.*

385–398).—Having established in a previous contribution (E. S. R., 59, p 420) a mass action equation describing the heterogeneous equilibria involved in zeolite and soil base exchange, the author of this communication from the Wisconsin Experiment Station has continued the work with an attempt to establish by the application of a constant, derivable from the equation mentioned and "characteristic for each compound involved in the base exchange reactions," the identity and composition of the material involved in base exchange reactions in soils. The following are included among the results presented:

The base exchange material of soils was found largely confined to the clay fraction, appearing to be so intimately mixed with other colloidal material as to render impossible its separation by specific gravity methods; and separation by means of solvents was complicated by the solution of other materials which obscured the results. It was found possible, however, by using the constants derived through the base exchange theory developed by the author to identify active alumino-silicates from different sources, the equilibrium constant appearing to be characteristic of each compound involved in the base exchange.

Soil from which active organic matter had been completely removed by gentle ignition gave values for the constant which were in close agreement with those observed for the clay material bentonite, but quite different from the values given by the true zeolites tested. It is suggested from these results that bentonite and the soil base exchange compounds are identical. Bentonite is said to be a mixture of at least two minerals, the separation of which by mechanical means is rendered very difficult by the colloidal properties of the substance.

The active mineral of bentonite was decomposed by 18 hours' boiling with normal hydrochloric acid, the liberated silicic acid having been extracted with a 10 per cent sodium carbonate solution. The analyses of these extracts then showed the ratio aluminum oxide: silicon dioxide to be almost 1:6.

From a further consideration of the base exchange reaction of cations of various valences, the active alumino-silicic acid appeared as a monobasic acid, "and when due allowance was made for the unsaturation of the compound, the analyses calculated from the free acid agreed fairly well with the formula: $H_2O(Al_2O_3.6SiO_2).8H_2O$.

The free acid was obtained by the leaching of a sample of bentonite with 0.1 N hydrochloric acid and washing the residue with water, the acid being insoluble. The water suspension of the acid showed a pH value of 2.73.

It is suggested that the alumino-silicic acid described is of widespread occurrence in soils, and is possibly the predominant mineral, if not the only one, constituting the inorganic exchange complex of nonalkaline soils.

A type of bacteria abundant in productive soils, but apparently lacking in certain soils of low productivity, H. J. CONN (*New York State Sta. Tech. Bul. 138* (*1928*), *pp. 26, figs. 4*).—An apparently new bacterial species, found abundantly in the good soils of the State but almost lacking in certain poorer soils, especially Volusia silt loam and Hoosick coarse sandy loam, is described and illustrated under the name of *Bacterium globiformis* n. sp. This organism was found not to grow in acid soils, but the two soils of low productivity above mentioned did not support good growth of the organism even after liming and inoculation unless a suitable source of carbon and nitrogen was also supplied. In either of the two soils noted *B. globiformis* was enabled to grow by supplying nitrogen in the form of an ammonium salt or an amino acid, and carbon in the form of a sugar, a polyhydric alcohol, or one of several organic acids, including acetic.

The specific name refers to the habit of the organism of changing from a rod form to a nearly or quite spherical form with increasing age of the culture.

Cellulose decomposition products as sources of energy for Azotobacter and B. amylobacter, P. G. Krishna (*Jour. Amer. Soc. Agron., 20 (1928), No. 5, pp. 511–514*).—This paper reports experiments leading to the conclusions that cellulose in the form of finely ground filter paper does not supply in its decomposition the energy requirements of pure cultures of Azotobacter; that the decomposition of straw can supply the needs, both of Azotobacter and *Bacillus amylobacter;* that *B. amylobacter* is able to fix more nitrogen when accompanied by cellulose-decomposing bacteria than when accompanied by Trichoderma, and utilizes the decomposition products more efficiently than does Azotobacter; and that "nitrogen-fixing organisms are dependent upon other microorganisms for breaking down the cellulose material into available carbohydrates which they can utilize."

Soil reaction and nitrogen fixation, P. G. Krishna (*Jour. Amer. Soc. Agron., 20 (1928), No. 5, pp. 515–518, fig. 1*).—A very good correlation between soil reaction and nitrogen fixation appeared, a progressive increase in nitrogen fixation with decreasing soil acidity having been observed. Where about 3 mg. of nitrogen were fixed by soils showing pH values of from 5.2 to 5.9, from 3.6 to 4.7 mg. were fixed under like conditions in soils showing pH values of from 5.9 to 7.65. No correlation could be demonstrated as between bacterial numbers and nitrogen fixation, bacterial numbers and soil reaction, or soil reaction and the disappearance of dextrose. "The soil reaction is the dominant factor influencing nitrogen fixation in soils."

Distribution of nitrates in three layers of fallow soil, J. B. Smith (*Soil Sci., 26 (1928), No. 5, pp. 347–350, fig. 1*).—The study here reported from the Rhode Island Experiment Station consisted essentially in the determination of the nitrate content at various intervals of the layers 0 to 7, 7 to 14, and 14 to 24 in. from the surface of a fallow area of Merrimac silt loam $\frac{1}{40}$ acre in extent, plowed in the spring, again plowed at midsummer and rolled, and cultivated throughout the experiment sufficiently to prevent weed growth. The fertilizer treatment consisted in the application of the equivalent of 1 ton per acre of a 6–8–6 complete fertilizer, this application having been thoroughly mixed with the top 7 in. of the soil. The forms of nitrogen used were sodium nitrate, ammonium sulfate, and a high-grade tankage. The samples were obtained by compositing 12 borings from each layer, and were examined immediately upon removal to the laboratory for moisture and nitrogen content. The recorded observations and conclusions given are as follows:

"For the entire season, there was little actual loss of easily nitrifiable nitrogen from the upper 2 ft. of a fallow plat, but vicissitudes of weather and the activities of the soil microorganisms caused decided temporary disappearances of nitrates. Proportionate disappearances of nitrates under growing crops might well constitute critical deficiencies of available nitrogen. Nitrates moving downward after leaching rains were often retained in the subsoil layers, and at such times the quantities there present were in excess of those remaining in the surface layer. Under midsummer conditions, nitrates leached from the upper soil layers were returned by the upward movement of soil water to replace that lost from the surface by evaporation."

Adsorption of potassium from different sources and nitrification studies with Norfolk sandy loam, G. V. C. Houghland (*Soil Sci., 26 (1928), No. 5, pp. 329–345, pl. 1*).—These experiments were carried out on a Norfolk sandy loam, very deficient in nitrogen, phosphorus, and potassium, and subject to much leaching during wet seasons. The investigation had the combined objects of the determination of the relative adsorption of potassium from potassium chloride, potassium sulfate, and 20 per cent manure salts, and of ascertaining the effects of these three sources of potassium upon the nitrification of dried ground fish, packing house tankage, and ammonium sulfate under the soil conditions specified. The data presented include the mechanical analysis of the soil upon which the experiments were made, together with its water-holding capacity (29.2), its total nitrogen and total potassium contents (0.077 and 0.885 per cent, respectively), and its pH value (6.4), as well as the direct results of the experiments indicated. The following are the conclusions stated:

(1) Samples of Norfolk sandy loam soil adsorbed considerable amounts of potassium when leached with 0.1 N solutions of potassium salts. (2) The addition of sodium chloride to a solution of potassium chloride, in the proportions found in manure salts, did not reduce the amount of potassium adsorbed by the soil. (3) Potassium sulfate was adsorbed to a slightly greater degree than potassium chloride. (4) The potassium adsorbed from a solution of potassium chloride was replaced by dilute acid more rapidly than the potassium adsorbed from a potassium sulfate solution. The addition of sodium chloride did not affect the replacement of the potassium adsorbed from potassium chloride. (5) The nitrification of dried ground fish, packing house tankage, and sulfate of ammonia was inhibited when manure salts were used as the only source of potassium in complete fertilizer mixture. (6) A slight stimulating effect on nitrification was obtained when potassium sulfate was used. (7) In general nitrification decreased as the concentrate of the potassium materials increased, but the decrease was greatest when manure salts were used.

The influence of fertilizer treatments on the content of exchangeable cations in Hagerstown silt loam, F. G. Merkle (*Soil Sci., 26 (1928), No. 5, pp. 377–384*).—From the figures obtained in extractions with 0.1 N hydrochloric acid of soil samples from the plats of the Pennsylvania Experiment Station general fertilizer experiment, in which an area of Hagerstown silt loam had been under continuous fertilizer treatment for 46 years, the author finds that when soil is repeatedly treated with commercial fertilizers or with organic nutrients "significant changes take place in the quantity and proportion of the so-called replaceable cations." Liming tends toward the saturation of the absorption complex with calcium. Part of the potassium applied in commercial fertilizers is retained in the "acidoid complex," and the ammonium ion from ammonium sulfate is retained under suitable conditions to constitute a large percentage of the total absorbed cations. In a case noted among the experimental data given, the ammonium ion amounted to 52 per cent of the total of both mono- and divalent bases absorbed. Ammonium sulfate "in the amounts used in this experiment has nearly exhausted the active calcium and replaced it with NH_4 and H ions," and "other fertilizer salts tend, in lesser measure, to exhaust the readily attackable calcium, replacing it with H ions."

[Long-continued studies of soil treatment with special chemicals] (*New York State Sta. Rpt. 1928, pp. 21–23*).—In 30 years' experiments "no improvements in crops were obtained that could be credited to the sulfur in calcium sulfate, magnesium sulfate, sodium sulfate, or iron sulfate," nor did these treatments cause any marked differences in the composition, though "there were some increases in the sulfur content of the stalks, stems, etc., but none of significance in the seeds and grains." With alfalfa as one of very few exceptions, the cumulative additions of calcium sulfate reduced the yields of most crops. Magnesium sulfate had little effect on yields, but brought about the undesirable effect of increasing the magnesium content of the crop at the expense of the calcium, the last-named constituent suffering "a noticeable depression . . . in such crops as red clover, alfalfa, corn and rape."

With respect to the possible harmful accumulation of sodium compounds from sodium salts repeatedly used as fertilizers, it is stated " that there is no indication of any harmful effect on the growth of most crops from the applications of either sodium sulfate or sodium chloride, although continued for 30 years." It is noted, however, that " the effect on the composition of such a crop as tobacco is undesirable, of course, and also on sugar beets if used for sugar."

The soil on which these experiments were carried out (Dunkirk clay loam) is noted as being " representative of much of the better agricultural land of the State," and is described as being normally only very slightly acid.

AGRICULTURAL BOTANY

Native plants in their relations to situation, climate, and soil, F. Rawitscher (*Die Heimische Pflanzenwelt in ihren Beziehungen zu Landschaft Klima and Boden. Freiburg i. B.: Herder & Co. 1927, pp. IX+238, pls. 11, figs. 64*).—Native plants are systematically discussed in relation to such conditions as situation, climate, and soil over a wide areal and chronological range, with a bibliography for each of the six principal divisions of the booklet.

A southern upland grass-sedge bog: An ecological study, B. W. Wells and I. V. Shunk (*North Carolina Sta. Tech. Bul. 32 (1928), pp. 75, pls. 21, figs. 11*).—The authors present the results of an intensive study from the successional point of view of the vegetation and habitat of an upland grass-sedge bog in southeastern North Carolina.

The bog associes is divided into two consocies, the typical bog represented by *Campulosus aromaticus* and the transitional bog represented by *Panicum* spp. The two consocies are said to be directly correlated in their distribution with the hydroperiod of the respective areas, the hydroperiod referring to the time the water table occupies a unit vertical zone or layer of soil next to the surface. The index hydroperiod is the time taken for the fall of the water table from the surface through a unit distance. This method is said to furnish a new way in which to deal quantitatively with the primary soil factor concerned in the development of the bog soil conditions.

Quantitative data were obtained for certain significant factors which follow as the result of the long hydroperiods. The lag or hold-over effect of the bog factor complex was found when the hydroperiods were shortened. The story of succession from the original shrub bog to the grass-sedge type is presented, and the probable changes in the absence of fire have been indicated.

Practical applications of the data obtained in this study are presented, such as the use of the native vegetation as indicators of drainage problems, the value of making hydroperiod observations, and the importance from a soil standpoint of preventing fires.

The life of the plant cell, R. Combes (*La Vie de la Cellule Végétale. Paris: Armand Colin, 1927, pp. 216, figs. 16*).—This is intended to be a presentation of what is actually known concerning the living matter of the plant.

The enzymatic function of mitochondria in the germination of cereals, E. S. Horning and A. H. K. Petrie (*Roy. Soc. [London], Proc., Ser. B, 102 (1927), No. B 716, pp. 188–206, pls. 6*).—The behavior of the mitochondria which is here indicated appears to lend considerable support to the enzymatic conception of mitochondrial activity. It is supposed that the starch-splitting enzyme is located within them or at their surface and is liberated when these bodies have reached the surface of the starch grains. In isolated endosperms the mitochondria of intracellular origin are able to effect starch hydrolysis and depletion. No evidence was found of a secretion of mitochondria from the aleurone layer or of depletion being in any way affected by secretion of enzyme therefrom. A similar secretion of mitochondria from the epithelial cells of the scutellum occurs during the germination of both wheat and barley.

Relation of hydrogen-ion concentration to growth of Chlorella and to the availability of iron, E. F. Hopkins and F. B. Wann (*Bot. Gaz., 81* (*1926*), *No. 4, pp. 353–376, figs. 5*).—In further studies (E. S. R., 59, p. 24) on the influence of H-ion concentration on growth under conditions as free as possible from complications due, for example, to the presence of microorganisms, the authors employed a Chlorella, and found that the growth rate in a highly buffered nutrient solution was directly influenced by the H-ion concentration when the pH was less than 5.7. The acid limit for growth of this unicellular green alga in the culture media listed was found to be 3.4.

In solutions of pH greater than 5.7, the availability of iron was a growth limiting factor. Certain organic compounds, especially sodium citrate, hold iron in solution in alkaline buffer mixtures of 7.4, though when calcium is present the iron is completely removed from such solutions by the precipitated calcium phosphate, supposedly as the result of adsorption. Since calcium is not essential for the growth of Chlorella it can be omitted from the culture solution. Iron can then be maintained in alkaline solutions in a form available for growth by adding sodium citrate. In such solutions maximum growth occurred at 7.5. The alkaline limit for growth has not yet been established. In unbuffered nutrient solutions, marked changes in the H-ion concentration may be brought about by the unequal absorption of ions, resulting in increased acidity which in turn renders the iron available for growth.

Further studies on growth of Chlorella as affected by hydrogen-ion concentration, F. B. Wann and E. F. Hopkins (*Bot. Gaz., 83* (*1927*), *No. 2, pp. 194–201, figs. 3*).—It was found in the work noted above that in a highly buffered culture solution containing calcium the true effect of the H-ion concentration on the growth of *Chlorella* sp. was masked by the lack of available iron in the more alkaline cultures, this condition being produced not alone by chemical precipitation of the iron but also by its adsorption on the amorphous precipitate of calcium phosphate present in all solutions more alkaline than pH 5.7. In a culture solution modified as here indicated, maximum growth of Chlorella, as measured by the dry weight of the crop produced, appeared at pH 7.5, the most alkaline solution of this series. The present paper presents results of experiments with solutions of H-ion concentrations ranging from pH 5.0 to 9.5, the purpose being to establish if possible the alkaline limit for the growth of Chlorella. The methods were the same as those previously used.

The acid limit for growth, as previously reported, is close to pH 3.4. This has been demonstrated in numerous experiments. The alkaline limit for growth is about pH 8.4. There appears to be no definite high point or maximum, the curve ascending rapidly from both the acid and the alkaline limits to a region lying between pH 4.6 and 7.0 in which the growth rate is quite uniform. Suggestions as outlined are, first, that the organism is not very sensitive to change in H-ion concentration within this range and, second, that under the conditions of the experiment some factor besides H-ion or OH-ion concentration is limiting between pH 4.6 to 7.0. It is thought possible that if the iron content in this region be increased the flat part of the curve would disappear.

Constant rates of continuous solution renewal for plants in water cultures, J. W. Shive and A. L. Stahl (*Bot. Gaz., 84* (*1927*), *No. 3, pp. 317–323, fig. 1*).—A continuously operating solution renewal apparatus for water culture plants is described as simple, compact, inexpensive, easy to operate, and moderate as to attention requirements. A complete series of 36 cultures, each with its system of continuous solution renewal as here described, has been conducted on a rotating table 5 ft. in diameter. This apparatus may be used with sand cultures as well as with plants in culture vessels.

Chloride and sulphate absorption from culture solutions by Egyptian and Upland cotton seedlings, A. R. C. HAAS (*Bot. Gaz., 84 (1927), No. 3, pp. 324–327*).—In connection with the tabulation which is shown, results are claimed to suggest that the absorption of chloride and sulfate by the roots of plants may not bear the same relationship to one another in the different types of cotton seedlings as do the chloride and sulfate content of leaf tissue fluids. The absorption of ions by plants as a basis for distinctions between different forms of cotton seedlings requires considerable further study under controlled conditions.

Significance of traces of elements not ordinarily added to culture solutions, for growth of young orange trees, A. R. C. HAAS and H. S. REED (*Bot. Gaz., 83 (1927), No. 1, pp. 77–84, figs. 6*).—This paper calls attention to the fact that long-continued use of certain nutrient solutions, commonly considered complete, may produce injurious effects which can be removed by the addition of traces of elements ordinarily considered unessential to plant growth. During experimentation on the effects of salts upon the growth and composition of orange trees, it was found that injury of a characteristic type appeared usually after from 18 to 24 months. Every orange tree of several hundred in sand cultures in asphalted galvanized iron cans that had received culture solutions made with distilled water showed symptoms of decline, while orange trees in large tank cultures of sand receiving a culture solution made with tap water showed no decline. Following a descriptive account, certain probabilities and bearings are discussed.

Chemical treatments for controlling the growth of buds of plants, F. E. DENNY (*Indus. and Engin. Chem., 20 (1928), No. 6, pp. 578–581, figs. 5*).—Desirable or interesting changes in product or habit are described as induced by stimulation due to the use of various chemical substances on such plants as potato, gladiolus, or *Deutzia gracilis*. Some of this work has been noted (E. S. R., 55, p. 829).

The anatomical-physiological relations of the latex vessels in the assimilative system [trans. title], O. BÖTTCHER (*Bot. Centbl., Beihefte, 44 (1927), 1. Abt., No. 3, pp. 218–240, pls. 2*).—The present account of the relations indicated, as found in a study employing Euphorbiaceae, Moraceae, and Cichoriaceae, includes also a somewhat detailed morphological and histological developmental comparison between latex vessels and sclerenchyma fibers as regards relations to the assimilative system.

Mobile equilibrium in leaf structure [trans. title], W. ALEXANDROV and O. ALEXANDROVA (*Bot. Centbl., Beihefte, 44 (1927), 1. Abt., No. 3, pp. 267–292*).—An attempt is made to detail, in the case of *Ipomoea purpurea*, the degree of relation existing between leaf characters (particularly structure) and the form of water provision.

Transpiration in drying leaves [trans. title], N. N. KISSELEW (*Bot. Centbl., Beihefte, 44 (1927), 1. Abt., No. 3, pp. 181–217, figs. 5*).—Both with and without water supply, the transpiration in leaves of Tilia, Acer, and Ampelopsis was greater in the case of leaves exposed to sunshine than in that of leaves in shade. As to degree of wilting, the leaves of these plants will not separate into sun leaves and shade leaves. In the case of Syringa and of Caragana, in which the shade leaves wilt much more quickly than do the sun leaves, transpiration of sun leaves goes on much more vigorously with water access and much less vigorously without water access than is the case with the shade leaves. If in the case of Syringa water access is interrupted, the relations are altered between the transpiration of sun and that of shade leaves in ways that are particularized. In Syringa without water access, the sun leaves apparently regulate transpiration better than do the shade leaves. In such case, transpiration in the sun leaves, in contrast with that in the shade leaves, is sharply lowered before any marked indications of wilting can be noted

Relation of desiccating winds to fluctuations in ash content of citrus leaves and phenomenon of mottle-leaf, A. R. C. Haas and H. S. Reed (*Bot. Gaz., 83 (1927), No. 2, pp. 161–172, figs. 3*).—The effects of desiccating winds upon citrus leaves were shown by the high transpiration and wilting rate. Analyses here reported show a temporary accumulation of salts in the leaves accompanying excessive transpiration. The excess salt content of leaves which survived the windstorms disappeared during subsequent calm weather. An intimate relation appears between climatic conditions and salt content of leaves. The increased salt concentration in the leaves appeared to be due largely to calcium increase, and the increase in salt content of the leaves mainly to increase in the water-soluble portion, especially calcium. Apparently increased salt content of the leaves afforded protection from excessive evaporation and emphasized the dynamic equilibrium between the leaf cell and its environment. Calcium loss through wind defoliation was inferred from the mottled condition of the next set of leaves, and the loss of organic nutrients such as carbohydrates and proteins was inferred from the small size of the leaves subsequently formed. In later cycles of growth the shoots produced large healthy leaves. The larger amounts of insoluble nitrogen found in injured leaves suggest that the desiccating wind had produced injury by coagulating the leaf cell proteins.

Seasonal variation in specific conductivity of wood in tropical plants with reference to leaf fall, R. S. Inamdar and A. L. Shrivastava (*Bot. Gaz., 83 (1927), No. 1, pp. 24–47, figs. 7*).—A fundamental distinction is claimed to exist between monopodial and sympodial growth, the conductivity in the latter falling off rapidly from the base to the apex. The distinction which has been drawn between deciduous and evergreen trees refers primarily to the respective demands made by them on the water supply for transpiration purposes. A correlation is alleged between the period of leaf fall and the increased water conducting capacity of the wood.

Thermal relations of leaf litter to spring revegetation [trans. title], F. Firbas (*Bot. Centbl., Beihefte, 44 (1927), 2. Abt., No. 2, pp. 179–198*).—The hastening effect of a layer of ground litter upon spring revegetation in deciduous trees is dealt with in detail. While this influence is alleged to be considerable, it is stated that its bearing upon earliness of blooming requires further investigation.

Grouping of legumes according to biological reactions of their seed proteins, I. L. Baldwin, E. B. Fred, and E. G. Hastings (*Bot. Gaz., 83 (1927), No. 3, pp. 217–243, figs. 2*).—In this work the protein characters of 29 species of the commonly cultivated legumes were studied by means of the precipitin and the anaphylaxis reactions. The results have shown that all members of any cross inoculation group are closely related with respect to the protein characters of their seeds. and in the majority of cases all legumes which possess closely related seed protein complexes cross inoculate. Possibilities are considered.

Studies on the Coccaceae, IX–XV, G. J. Hucker (*New York State Sta. Tech. Buls. 135 (1928), pp. 31, pl. 1; 136, pp. 18, pls. 5; 141, pp. 13; 142, pp. 10; 143, pp. 64; 144, pp. 20*).—In continuation of studies on the Coccaceae (E. S. R., 52, p. 519; 55, p. 326; 59, p. 269) seven additional contributions are given as follows:

IX. *Further studies on the classification of the micrococci.*—Studies of 361 cultures of micrococci are said to have shown that 3 additional species should be added to the 16 formerly recognized. These species are *Micrococcus agilis, M. rhodochrous,* and *M. roseofulvus.* A revised key to the species of Micrococcus is given.

X. *The motility of certain cocci,* G. J. Hucker and L. M. Thatcher.—Studies of strains of micrococci, sarcinae, and streptococci have shown that some species were actively motile, and flagella were demonstrated on three of them. No characters were found which were correlated with motility, and it is believed that the motile cocci should not be placed in a separate genus.

XI. *Effect of the medium upon the formation of chains by the streptococci.*—Selected strains of streptococci grown in milk, blood-serum broth, and bile broth showed that the medium influenced the chain-forming ability of the organisms. *Streptococcus lactis* produced no chains when grown in milk, but did when grown in bile or blood-serum broth. Pyogenic streptococci generally formed long chains when grown in milk or broth containing bile or blood serum, and the presence of blood serum or bile is said to have enhanced the latent ability to form chains. Exceptions were noted that preclude the conclusion that milk containing paired streptococci was free from pyogenic types.

XII. *Action of the streptococci upon casein.*—Paracasein and casein were found to be unavailable as sources of nitrogen for the streptococci. When furnished chemically pure casein as the only source of nitrogen, these strains of streptococci did not produce visible growth if washed cells were used as the inoculum. In large amounts of unwashed cells the streptococci associated with milk and milk products generally produced growth. Under no condition did the pyogenic streptococci produce growth when chemically pure casein was furnished as the only source of nitrogen.

XIII. *Production of carbon dioxide by the streptococci.*—Studies are reported of a number of strains of streptococci to determine their ability to produce carbon dioxide from peptone or carbohydrates. Most of the strains showed an increase in the amount of carbon dioxide produced as the amount of peptone in the medium was increased. *S. citrovorus* and *S. kefir* produced no carbon dioxide from peptone, but formed relatively large amounts from glucose. The ability to produce carbon dioxide from glucose and not from peptone seemed to be confined to these two species.

XIV. *Certain biochemical reactions produced by the streptococci.*—The author claims that the streptococci can be divided into two groups on the basis of the type of lactic acid produced. The low acid producers, which were found generally to prefer levulose to glucose, attack the pentoses, forming relatively large amounts of volatile acid, and many times produce carbon dioxide, and all form levolactic acid. It is claimed that the more common types of streptococci all produce dextrolactic acid. The nonhemolytic strains are said to produce acetic acid and a volatile acid with a higher distilling constant than acetic, while the hemolytic types form, in addition to acetic acid, a volatile acid with a lower distilling constant than that found for acetic acid.

The strains which produce levolactic acid were found to hydrolyze the lactose much faster than when it was converted into acid, while the remaining types produced acid as rapidly as the lactose was hydrolyzed.

The conclusion was drawn that the biochemical reactions produced by the streptococci studied may be used as a basis for differentiating the species in this genus.

XV. *Relationships of the various acid-proteolytic cocci.*—It is claimed that there are two distinct types of acid-proteolytic cocci. One comprised strains which prove to be micrococci, the remaining type strains of streptococci. The species belonging to each type are enumerated.

It is concluded that acid-proteolytic cocci should not be considered from a systematic standpoint as a separate genus. Many of the organisms of this type being studied in bacteriological laboratories are said to be true streptococci, while others are cocci identical with well-recognized and common species of the genus Micrococcus.

Classification of the streptococci (*New York State Sta. Rpt. 1928, pp. 28, 29*).—Following the study of the micrococci (see above), work was continued with the streptococci to arrive at a basis for their classification. Studies were made of the various species of this group, and the results are said to clarify much of the confusion in regard to the relationship of important species and to aid in correlating the results of previous investigators. This is said to be particularly true of the types of streptococci that survive pasteurization. These types are considered to be entirely different from the forms associated with the normal souring of milk.

GENETICS

The basis of breeding, L. F. Whitney (*New Haven, Conn.: Earle C. Fowler, 1928, pp. [7]+260, figs. 92*).—The presentation of the principles of inheritance in popular terms.

Animal evolution, A. H. Clark (*Quart. Rev. Biol., 3 (1928), No. 4, pp. 523–541, fig. 1*).—A discussion of animal evolution in which suggested variation in different groups of animals is pointed out as a logical basis for the origin and development of new forms and the more delicate adjustment to environment.

The stereogene as a hereditary unit: A new theory of inheritance [trans. title], L. Karczag (*Ztschr. Induktive Abstam. u. Vererbungslehre, 48 (1928), No. 1, pp. 86–144*).—Essentially a chemical hypothesis for the explanation of the inheritance and determination of characters, including sex.

The nature of chromosomes.—I, Effects of reagents on root tip sections of Vicia faba, R. O. Earl (*Bot. Gaz., 84 (1927), No. 1, pp. 58–74, figs. 19*).—Sections of *V. faba* root tips treated with solutions of tribasic sodium phosphate, acid sodium phosphate, sodium phosphate at pH 5, sodium hydroxide, and pepsin hydrochloric acid, respectively, showed swelling of the nucleus and chromosomes and almost eliminated staining capacity in the first and fourth of these preparations. Supposedly chromatin is dissolved out. The nucleolus is shown to consist of two elements, a peripheral and a central, the former probably contributing to the formation of the chromosomes. A theory is proposed to account for chromonemata as indicating the presence of a thread of ultramicroscopic genes whose split halves mutually repel each other within the chromosome.

The suggestion is made that the visible parts of the chromosome and nucleus form an internal environment for the interaction of the genes, but that they are not themselves the physical basis of Mendelian heredity. Changes in the constitution of this visible matter might produce a profound effect that only unspecialized forms could survive, gene mutations being responsible for minor changes involving specialization.

Chromosome studies in Cyperaceae, O. Heilborn (*Hereditas, 11 (1928), No. 2–3, pp. 182–192, figs. 3*).—The meiotic divisions of *Carex hornschuchiana* × *C. oederi* are described, and additional chromosome numbers in *Carex* spp. are reported. The author states that numbers ranging from 9 to 56 have been found.

Chromosome studies in the Cyperaceae, with special reference to Scirpus, G. C. Hicks (*Bot. Gaz., 86 (1928), No. 3, pp. 295–317, pls. 2*).—Cytological studies at Harvard University on material collected in the vicinity of Boston suggested that aneuploidy is present in American species of Scirpus and might be due to hybridization The chromosome numbers found include 18, 20, 21, 25–30, 28, 33, 34, 38, 39, 50–64, 53–55, 55, 55–57.

Development of the embryo sac and young embryo of Hicoria pecan, N. C. Woodroof (*Amer. Jour. Bot., 15 (1928), No. 7, pp. 416–421, pls. 3*).—In studies at the Georgia Experiment Station the author found 4 megaspores to be the invariable rule in the pecan, the 4-megaspore stage being reached at the same time the stigmas became receptive. The embryo sac containing 8 nuclei became mature 1 week later. The pollen tube did not enter the embryo sac until about 2 weeks following pollination. This entrance was followed by an immediate fusion of one of the male nuclei with the primary endosperm nucleus, which in turn divided to form endosperm nuclei. The fusion of the egg and the second male nucleus did not occur until the fifth or sixth week following pollination, and the first division of the fertilized egg occurred about 2 months after pollination.

Root inheritance in peas, F. C. Jean (*Bot. Gaz., 86 (1928), No. 3, pp. 318–329, figs. 4*).—Studies at the Colorado State Teachers College with two varieties of garden peas showed root length to segregate in the F_2 generation in typical Mendelian form. A marked varietal difference was noted in the ratio between root and top length. Unsuccessful attempts to materially influence root penetration of tall plants by top pruning further suggest that genetic factors are the primary cause of root length. The form of the root system was very similar in the two varieties.

Natural crossing between white flowered and yellow flowered sweet clover, L. E. Kirk (*Sci. Agr., 9 (1929), No. 5, pp. 313–315*).—Less than 0.01 per cent of natural crossing was observed at the University of Saskatchewan when a row of white-flowered sweet clover was grown between 10 rows of yellow-flowered on either side. In a cross between the two species the F_1 hybrid possessed cream-colored flowers, and the F_2 progeny, consisting of 150 plants, gave four shades of yellow besides pure white and pure yellow, most being light or dark cream.

Rye-wheat hybrids of the F_1 generation in direct and reciprocal crosses [trans. title], N. Meister and N. A. Ti͡umi͡ukov (Tjumjakov) (*Zhur. Opytn. Agron. I͡ugo-Vostoka (Jour. Expt. Landw. Südost. Eur.-Russlands), 4 (1927), No. 1, pp. 87–97, figs. 5; Eng. abs., p. 97*).—Rye ♀ × wheat ♂ hybrids were obtained from local rye pollinated by a pure line of winter wheat (No. 648) at Saratov. About 2.5 per cent of successful fertilization was obtained in these reciprocal crosses, while more than 60 per cent has been noted in direct crosses. Plants of the F_1 from the reciprocal crosses closely resembled those from direct crosses in morphological characters and fertility. Maternal inheritance observed by Gaines and Stevenson (E. S. R., 48, p. 334) in rye × wheat crosses was not confirmed.

Rye-wheat hybrids from reciprocal crosses, N. Meister and N. A. Tjumjakoff (*Jour. Genetics, 20 (1928), No. 2, pp. 233–245, pl. 1, figs. 4*).—An English version of the study noted above.

The pigmentation of feathers in hybrid fowls [trans. title], O. Kuhn (*Züchtungskunde, 3 (1928), No. 12, pp. 615–619, figs. 5*).—From a study of the characteristics of feathers developing after plucking, the author concluded that the changes observed in the characteristics of feathers of hybrid fowls were a property of the individual feather. The changes in the feathers associated with advancing age, however, were due to time and were not a property of the individual feather follicle.

"Stick" and "multilunar," a fourth linkage group in the silkworm, Y. Tanaka and S. Matsuno (*Jour. Dept. Agr., Kyushu Imp. Univ., 1 (1927), No. 8, pp. 266–274, pl. 1*).—A character designated as stick, causing thin and stiff caterpillars, is described in the silkworm. The growth rate of such larvae is slower than normal and mortality is about 5 per cent heavier, although the difference varies with conditions. The gene for stick was linked with the gene multilunar, with 25.8 per cent crossing over. These, therefore, form a fourth linkage group.

Some remarks on symbols, multiple allelomorphism, crossing over, and linkage groups in the silkworm, Y. Tanaka (*Jour. Dept. Agr., Kyushu Imp. Univ., 1 (1927), No. 8, pp. 275–279, fig. 1*).—The author suggests modification in the symbols for certain characters, and calls attention to the four linkage groups which have so far been found in the silkworm.

A sex-linked translucent gene which occurred independently in three different strains of the silkworm, Y. Tanaka (*Jour. Dept. Agr., Kyushu Imp. Univ., 1 (1927), No. 8, pp. 261–265*).—The author notes that the sex-linked translucent gene *os* has occurred independently in three different races of silkworms, which is considered as an example of parallel mutation.

The determination of the sex function in the fowl [trans. title], A. Pézard (*Ergeb. Physiol., 27 (1928), pp. 552–656, figs. 50*).—The author discusses the effects of castration of roosters and hens at different ages, bringing out the influence on the development of the various secondary sexual characteristics and other body characters. The relation of gonad transplantation to the development of particular characters is also discussed.

Ovarian secretion and tumor incidence, W. S. Murray (*Jour. Cancer Research, 12 (1928), No. 1, pp. 18–25, fig. 1*).—Essentially noted (E. S. R., 59, p. 325).

Evidence that cancer is not a simple Mendelian recessive, C. C. Little (*Jour. Cancer Research, 12 (1928), No. 1, pp. 30–46*).—The author presents evidence to show that cancer in mice is not inherited as a simple Mendelian recessive, since matings of unlike cancerous parents produce many more noncancerous individuals than do matings of parents with similar forms of cancer, and different types of cancer are dependent upon different genes. More than one genetic factor is involved in the inheritance of the nonmammary types, and the genetic behavior of mammary cancer is quite distinct and different from that of other types in that mammary cancer is apparently sex limited and dominant.

FIELD CROPS

The transpiration ratio of farm crops and pasture plants in the Adelaide district, A. E. V. Richardson and H. C. Trumble (*Jour. Dept. Agr. So. Aust., 32 (1928), No. 3, pp. 224–244, figs. 6*).—Determination of the water requirements of farm crops and typical pasture plants in the Adelaide plains area during 1925, 1926, and 1927 by the University of Adelaide showed that the transpiration ratio (E. S. R., 57, p. 733) varied from season to season with variations in the intensity of the physical environmental factors during the growing period of the crop, and particularly during the critical period of maximum transpiration. In southern Australia this critical period for cereal crops occurs normally during October, when the evaporation rate is often subject to great temporary acceleration from hot, dry, northerly winds.

The average transpiration ratio for the period for dry matter and grain, respectively, was for barley 339:828, wheat 328:1,147, oats 379:1,153, rye

469:1,586, and peas 535:1,943. For wheat the transpiration ratio increased as seeding was delayed, although the ratio for grain did not increase so fast as that for dry matter, due to an increase in the migration ratio (percentage of grain to straw) with the later plantings. With cereals and pasture plants the transpiration ratio varied with the growth stage at which the crop was harvested. Grasses and clovers produced dry matter at relatively low cost during winter and spring, whereas in the final stages of growth considerably more water was required.

The absorption of nutrients by the roots seemed independent of transpiration, since in barley most of the nitrogen and mineral nutrients were taken up at a rather early growth stage, while transpiration increased exponentially and reached a maximum just after flowering. Application of soluble phosphates resulted in a marked reduction of the transpiration ratio of pasture grasses and clovers, particularly in the early growth stages. With *Danthonia penicillata*, for all degrees of soil saturation and all harvests, application of superphosphate (acid phosphate) led to a material reduction in the transpiration ratio.

The crops of Sind: Their geography and statistics, G. R. Ambekar (*Bombay Dept. Agr. Bul. 150 (1927), pp. V+158+XI, pls. 10*).—Practical information is compiled on the distribution, acreage, production practices, uses, and in many instances insects and other pests and diseases, of cereal, legume, oilseed, fiber, sugar, fodder, dyestuff, condimental and drug crops, vegetables, and fruits cultivated in Sind.

Get alfalfa and clover seedings on light soils, A. G. Weidemann (*Michigan Sta. Quart. Bul., 11 (1928), No. 2, pp. 55-57*).—Summer seedings of alfalfa and clover in grain stubble on light sandy soils succeeded during 4 successive years at Grayling, Mich. The stubble protects from blowing sand, takes no moisture, tends to decrease evaporation, and holds a snow cover. Stubble of rye and oats has certain merits and demerits, the best stubble perhaps being that left by peas and oats for hay or some similar crop cut before ripening.

New species of grasses from the United States, A. S. Hitchcock (*Biol. Soc. Wash. Proc., 41 (1928), pp. 157-163*).—Thirteen species pertaining to Puccinellia, Poa, Eragrostis, Agrostis, Muhlenbergia, Sporobolus, Digitaria, and Eriochloa are described as new, and 23 new binomials are listed.

Spring grains in New Jersey, H. B. Sprague and E. E. Evaul (*New Jersey Stas. Bul. 473 (1928), pp. 40, figs. 15*).—Variety trials led to the recommendation of Kanota oats and Alpha barley for New Jersey conditions. Leaders among the oats varieties included Kanota, Fulghum, Kherson, and Cornellian, and the highest yielding barleys embraced Alpha, Club Mariout, and Manchuria. Kota, Red Bobs, and Java led the spring wheats, but the crop is not advised for the State.

Barley has surpassed oats in the quantity of feed produced per acre, the best oats variety producing 1,656 feed units of grain and the poorest barley 1,860. Alpha barley, the best variety, produced 2,158 feed units per acre, 502 more than that produced by Kanota, the best oats. Spring wheat varieties produced less feed per acre than most of the oats varieties.

The soils and environmental conditions in the State are described, with comment on the relation between yields of spring grains and weather conditions.

Abacá-soil conditions in two districts of the Philippine Islands and their relation to fiber production, P. L. Sherman (*Philippine Jour. Sci., 37 (1928), No. 1, pp. 1-19, pls. 2*).—The problem of weak fibers in abaca was investigated in the Bicol provinces of Luzon and in the Davao Province of Mindanao.

Differences in the quantity, texture, color, and composition of the ash contents of a fiber were found to be influenced by locality, variety, maturity of the plant, and the grade of fiber. Analyses of ashes of abaca fiber samples indicated that the main food constituents other than nitrogen, coming from the soil, include potash, iron, alumina, lime, magnesia, and silica. Mechanical analyses of abaca soils suggested that abaca can thrive on the heaviest as well as the lightest soils if favorable chemical conditions and the proper variety be provided.

Strong fiber was characterized by resistance to the action of hot water, whereas weak fiber had a relatively high percentage of water-soluble substance. The hot water extracts of strong and weak fibers consisted of varying quantities of higher organic and presumably fatty acids, both free and combined as salts with alumina, lime, iron, and potash. In the residue from weak fibers aluminum predominated largely over the other bases, while calcium and potassium were in excess in the residue from strong fiber.

The production of abaca fiber is held unique in that the soil supports the same crop indefinitely without plowing or cultivation (except in one district) or fertilization beyond the abaca waste left to ferment in the fields after harvest. This practice has resulted in a steady and heavy exhaustion of necessary nutrients and a consequent permanent acid condition on the soil. These conditions are indicated by the low average yield per hectare of the older abaca districts, and in the fiber an excess acidity that always produces short durability and an enforced substitution of necessary salts by inferior ones which results in a loss of tensile strength. Modern practices in the Davao District have resulted in a relatively better soil condition, increased fiber yield per hectare, and uniformly high fiber quality.

The tensile strength of abacá fibers in relation to their acidity, P. L. and H. E. SHERMAN (*Philippine Jour. Sci., 37 (1928), No. 1, pp. 21–40*).—Determinations on fibers of abaca from many sources showed that the natural acid content of abaca is greater in fibers having low tensile strengths. As the tensile strengths of abaca samples decrease about 10 kg. per gram of weight per meter of length, the natural acidity of the fiber increases about 0.42 cc. for each 10 gm. The natural acid content was also found higher for Canton fibers with a low tensile strength, although the relationship between the tensile strength and the acid content was less definite for these hybrids than for true abaca. Loss of tensile strength in abaca during storage was also affected by the acid content.

Fermentation as affecting the quality of Philippine abacá, T. BAÑUELOS and P. L. SHERMAN (*Philippine Jour. Sci., 37 (1928), No. 1, pp. 41–67, pl. 1*).—Field observations and experiments gave indications that all commercial abaca fiber produced by present methods of stripping is more or less heavily contaminated with bacteria, and that the juice and soluble substances accompanying the fiber furnish the media for their prompt and vigorous growth. The process of drying should immediately follow stripping, since it directly results in the practical sterilization of the fiber so long as it remains dry thereafter, whereas failure to dry fresh fiber promptly and thoroughly or wetting after once dried results in fermentation, the immediate effects of which are increased acidity, lowered tensile strength, change of color, and decrease of luster. These damaging effects on the fiber appear to be caused by the acid fermentation products of its soluble constituents as well as by direct action of the bacteria on the fiber.

A national view of the adaptation of domestic alfalfa seed, H. L. WESTOVER (*Seed World, 24 (1928), No. 12, pp. 7–9, 42, fig. 1*).—In emphasizing the importance of using adapted varieties and strains of alfalfa, the author discusses factors encountered in varietal tests with the crop and indicates the particular adaptation of prominent varieties.

Natural crossing in barley, F. J. Stevenson (*Jour. Amer. Soc. Agron., 20 (1928), No. 11, pp. 1193–1195*).—When white-hull varieties of barley were grown between black-hull sorts of the same type, growth habit, and heading date at the Minnesota Experiment Station, no hybrids were found in Hanna, a 2-rowed barley grown between 2 rows of Jet, nor in Oderbrucker, a 6-rowed sort grown between 2 rows of Lion, whereas Consul, a 6-rowed barley grown between 2 rows of Gatami, showed 0.04 per cent in 1924, 0.12 per cent in 1925, and 0.15 per cent in 1926 of natural crossing. While one natural cross out of more than 10,000 plants was found between Manchuria and a black type, no natural crossing was observed between Manchuria, an awned variety, and Nepal, a hooded variety. Seasonal differences were not as effective as varietal differences.

The influence of environmental factors on pigment patterns in varieties of common beans, F. V. Owen, I. M. Burgess, and C. R. Burnham (*Jour. Agr. Research* [*U. S.*], *37 (1928), No. 7, pp. 435–442, figs. 3*).—When Small Yellow Eye and Old Fashioned Yellow Eye beans were grown on rich soil at the Wisconsin Experiment Station in 1926 they carried more pigment than when grown on sandy soil at Monmouth, Me., by the Maine Experiment Station, apparently due to environmental influences but not the result of climatic differences. This was confirmed when highly colored Wisconsin-grown seed of Small Yellow Eye planted at Monmouth on sandy soil in 1927 failed to produce even as much pigment as Maine-grown seed.

Two new varieties of red kidney bean, Geneva and York, W. O. Gloyer (*New York State Sta. Tech. Bul. 145 (1928), pp. 51, figs. 6*).—The history and characteristics, cooking quality, and reaction to diseases are described for Geneva (E. S. R., 58, p. 828) and York, new red kidney beans derived from a cross made in 1920 between White Kidney and Wells Red Kidney beans. Methods of bean improvement are discussed briefly.

Geneva and York surpassed Wells in yield and quality, showed resistance to the α and β strains of *Colletotrichum lindemuthianum*, although similarly susceptible to the γ strain, and both showed disease escapement to bacterial blights on soils of reasonable fertility.

The seed coat color seemed to be related to environmental conditions, such as ripening, harvesting, and storage conditions, as well as to varietal and heritable factors. The red pigment in the Wells Red Kidney bean appeared to be crudely amphoteric, showing red to acid and brown to alkalies. Colors of medal bronze, brown, seal brown, and reddish black were easily produced by the action of ammonia fumes on beans of proper moisture content. Similar shades were found in the seed coat colors segregated in the F_2 generation.

Cooperative tests with the Geneva bean in 30 localities under varied conditions of culture demonstrated that while poor, immature seed, too early planting, too close planting, lack of drainage, drought, root rots, soil acidity, and weed competition were of some significance, lack of soil fertility appeared to be the greatest single factor responsible for poor yields on New York farms. Nitrogenous fertilizers increased the vigor of the plants so as to enable them to escape the blights under field conditions.

Corn and corn growing, H. A. Wallace and E. N. Bressman (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, 3. ed., rev., pp. VII+371, figs. 101*).—A book noted earlier (E. S. R., 50, p. 694) has been revised and rearranged.

Relation of stand to yield in corn, P. J. Olson (*Jour. Amer. Soc. Agron., 20 (1928), No. 11, pp. 1235–1237*).—Corn yield was reduced in almost exactly the same ratio as the reduction in stand in a seed study involving 82 individual ear rows at the North Dakota Experiment Station, apparently justifying a 100 per cent correction for stand to bring the rows to a comparable basis.

The improvement and selection of cotton [trans. title], A. F. Kidder (*Estac. Expt. Agr. Soc. Nac. Agr., Lima, Circ. 8 (1928), pp. 17*).—A discussion of the principles involved in the improvement of cotton.

Variation in seed fuzziness on individual plants of Pima cotton, T. H. Kearney and G. J. Harrison (*Jour. Agr. Research [U. S.], 37 (1928), No. 8, pp. 465–472, figs. 4*).—Biometrical studies on plants of related inbred families of Pima American Egyptian cotton grown at Sacaton, Ariz., revealed a strong tendency for the bolls on the lower fruiting branches to have fuzzier seeds than the bolls on the higher branches. Seeds produced nearest the base of the branch also tended to be fuzzier than those produced farther out on the branch. Nutrition, temperature, and illumination are discussed as influential factors.

Annual report of the Indian Central Cotton Committee, Bombay, for the year ending August 31, 1928 (*Indian Cent. Cotton Com., Bombay, Ann. Rpt. 1928, pp. [2]+118, pls. 6*).—This report is similar in scope to that of 1926 (E. S. R., 57, p. 828).

Natural crossing in flax, A. W. Henry and C. Tu (*Jour. Amer. Soc. Agron., 20 (1928), No. 11, pp. 1183–1192*).—When Ottawa 770B, a white-flowered flax, was grown at the Minnesota Experiment Station in rows 1 ft. apart adjacent to Winona, a blue-flowered sort, it was found that 1.25 per cent of natural crossing had occurred, as indicated by the appearance of blue-flowered rogues in the white-flowered variety. In the following year 1.71 per cent of natural crossing was demonstrated between Ottawa 770B and a selection of Argentine flax. Assuming an equal amount of crossing between white-flowered plants within the row, the figures doubled may approximate the total quantity of natural crossing in these tests. Increasing the distance between the rows resulted in a reduction of the natural crossing from 1.26 per cent at 1 ft. apart to 0.33 per cent at 5 ft. apart. Observations suggested that thrips may be important agents of natural crossing in flax. Ways of preventing cross pollination are suggested.

Plant characters and yield in grain sorghums, J. H. Martin (*Jour. Amer. Soc. Agron., 20 (1928), No. 11, pp. 1177–1182, fig. 1*).—Analysis of measurements of several important plant characters of grain sorghums grown in several regions of the United States for different periods revealed that the yields of fields of grain sorghums were more closely correlated with the number of heads per acre than with size of head or weight of grain per head. The number of heads per acre and both the weight per bushel of grain and the average size of heads were either correlated negatively or not significantly in three varieties studied. Stalk height within a given variety was highly correlated with grain yields, and a close correlation was noted between the yields of grain and stover in kafir. In milo the percentage of erect heads was negatively correlated with yield and with plant characters determining yield, and the shelling percentage of heads of various sizes was nearly constant although slightly lower in heads of extreme sizes. The size or plumpness of seeds of a given sort or variety was correlated with weight per bushel.

Fertilizer and legume experiments following sorghums, J. P. Conrad (*Jour. Amer. Soc. Agron., 20 (1928), No. 11, pp. 1211–1234, figs. 3*).—In continued investigations by the California Experiment Station concerned with the depressing effects of sorghum on the yields of following crops (E. S. R., 59, p. 135), barley grown after White durra on plats receiving 100, 200, and 400 lbs. of sodium nitrate per acre averaged at Davis 810, 1,125, and 1,495 lbs., respectively, of threshed grain more than the 1,225 lbs. from the unfertilized checks. Significant yield increases followed 200- and 400-lb. applications of ammonium sulfate to barley and wheat following hegari in the Imperial Valley. Yields were generally higher when the fertilizer was applied 35 and 67 days after planting instead of at planting.

Pot tests wherein different weights of sorghum roots, corn roots, and sucrose were added to the soil showed that barley yields decreased with increasing quantities of sorghum roots and sucrose added, and nitrates in uncropped pots took a similar course, whereas fenugreek, naturally inoculated at Davis, made normal growth. Relationships were shown between the depression of nitrates by sorghum roots and by an equivalent quantity of sucrose, and likewise between barley yields and nitrates thus depressed. Barley yields in field trials were depressed progressively after millet, corn, broomcorn, and sweet sorghum below the yield after fallow, whereas on all plats previously in crop fenugreek grew normally, yielding higher than after fallow.

The theory, discussed earlier, of competition between microorganisms and the crop plants for nitrogen and possibly other essential elements is held to explain all of these observations satisfactorily. The practically normal growth of alfalfa and fenugreek after sorghums seems to suggest that planting a legume may be the best way to avoid the so-called injurious after effects of sorghum. The possibility of a profitable use of nitrogenous fertilizers where small grains normally follow sorghums is discussed briefly.

Grain and sweet sorghums in Oklahoma, A. DAANE and K. H. KLAGES (*Oklahoma Sta. Bul. 180 (1928), pp. 19, figs. 3*).—Cultural and variety tests with grain sorghums and sorgos at the station and outlying fields are reported for varying periods.

Blackhull kafir and Darso led the grain sorghums and Sumac and Orange sorgo gave the highest forage yields, although African Millet and Dwarf Ashburn sorgo also yielded well. The suitability of the several varieties for different conditions in the State is indicated briefly. The best yields came from April 15 to 30 plantings, although seasonal conditions were quite influential in this respect. Early seeding is advised with somewhat later dates in western and southwestern Oklahoma than near the station. The closer spacings have given the higher grain and forage yields with kafir at the station.

Report on the sugar beet experiments, 1927 (*Dublin: Dept. Lands and Agr., 1928, pp. 30*).—Results in further experiments with sugar beets (E. S. R., 58, p. 33) in numerous centers in the Irish Free State are reported.

Dutch, German, Danish, and French seed have ranked in order during the period 1925–1927. Although similar in yield and sugar content, the Dutch seed was distinctly superior to the German in tendency to bolt.

Top-dressing with 1 cwt. of sodium nitrate per acre after singling did not lower appreciably the sugar content of the beet, and the yield increase resulting therefrom depended largely on the soil condition and crop growth when applied. With favorable conditions the top-dressing did not materially increase yield, whereas in unfavorable seasons or under adverse conditions, e. g., where the crop was attacked by pests or diseases, the top-dressing helped to carry the plants over a critical period in the early growth stages. The top-dressings of more than 1 cwt. of sodium nitrate slightly depressed the sugar content without compensating increase in yield.

In 1927 the best yields and sugar contents were made in drills 21 in. or less wide, and best results were had with plants singled at the stage when 4 rough leaves were developed.

Sugar beet in France, Belgium, Holland, and Germany, A. BRIDGES and R. N. DIXEY (*Oxford, Eng.: Clarendon Press, 1928, pp. [6]+119, pls. 6, figs. 5*).—A practical discussion is given of continental practices involved in growing, harvesting, and transporting sugar beets. Their reception at the factory, costs, price fixing, and the effect of the sugar beet crop on general agriculture are also commented on.

The development of German sugar beet production, with special consideration of cultural technique, A. HILDEBRANDT (*Die Entwicklung des Deutschen Zuckerrübenbaues mit Besonderer Berucksichtigung der Ackerbautechnik. Inaug. Diss., Landw. Hochsch., Berlin, 1928, pp. 113, fig. 1*).—This dissertation comprises an elaborate discussion of the influence of environmental factors, varieties, cultural methods, and field practices on the production of sugar beets in Germany before, during, and since the World War. The bibliography lists 193 titles.

The sugar industry in Hawaii, G. KLINGE (*Notas sobre la Industria Azucarera del Hawaii. Lima, Peru: Sociedad Nacional Agraria, 1928, pp. [1]+220, pls. 33, figs. 32*).—This book gives a rather comprehensive discussion of environmental, political, and economic conditions, labor, research, production and irrigation practices for sugar cane, insect pests and diseases, harvesting methods, transportation, and manufacturing processes, all concerned with the production of cane sugar in Hawaii.

Technical and financial conditions in the Philippine sugar industry [trans. title], Y. HENRY (*Bul. Écon. Indochine, n. ser., 31 (1928), Nos. 192, pp. 141–197, pls. 32; 193, pp. 233–343, pls. 6*).—A critical exposition of the technical and economic factors involved in sugar production in the Philippine Islands treats of the status of the industry, soils, climate, field organization and management, varieties, diseases, fertilizers, cultural practices, yields, organizations of planters and manufacturers, equipment and activities of centrals, and the sale of sugar.

Evidence and observations on establishing sweet clover in permanent bluegrass pastures, L. F. GRABER (*Jour. Amer. Soc. Agron., 20 (1928), No. 11, pp. 1197–1205*).—Further experiments and observations at the Wisconsin Experiment Station on the establishment of sweet clover in bluegrass pastures (E. S. R., 59, p. 34) gave additional emphasis to the need of removing accumulations of old grass by burning or otherwise to permit legume seed to come into contact with the soil. Where burning is not feasible, cultivation of pasture lands by a disk or spring tooth harrow probably will be needed for such soil contact and for successful seeding on dense sods. On fertile soils with very dense sods both burning and cultivation may be advisable. For seeding during the spring period of alternate freezing and thawing, scarified sweet clover seed was much superior to seed with hulls on. 30 lbs. of scarified seed per acre giving denser and more uniform stands than 20 and 10 lb. rates. The yield increases in both grass and sweet clover seem to justify the avoidance of grazing long enough to permit establishment of a thick stand of seedling sweet clover plants in a bluegrass sod.

[The research activities and results of the State Institute for Tobacco Investigations], A. A. SHMUK (SCHMUCK) (*Gosud. Inst. Tabakoved. [Krasnodar] (State Inst. Tobacco Invest.) Bul. 42 (1928), pp. 48, pl. 1, figs. 2*).—The work with tobacco at the institute at Krasnodar during 15 years is reviewed in regard to the chemistry of tobacco. fermentation, variety studies, physiology, vegetation experiments, field experiments, and the insects and diseases of tobacco.

Moisture in combined wheat, A. DAANE (*Oklahoma Sta. Bul. 183 (1928), pp. 15*).—Moisture determinations made on wheat samples direct from combines operating in fields in different parts of the State showed wheat from thick stands in northwestern and southwestern Oklahoma to contain slightly more moisture than thin and medium stands, while lodged grain was intermediate. Moisture content decreased with passage of the day, except where the grain was rather immature. As affected by topography, wheat from hollows varied from about 0.2 per cent more moisture than wheat from hills in northwestern Oklahoma to around 1.5 per cent more in west-central and southwestern Oklahoma. The rate of drying after rain or the moisture content in the grain varied with the humidity and the stage of maturity. The weight per bushel rose with decrease in moisture content. The bearing of these observations on harvest practice is discussed briefly.

Notes on the effect of cutting bracken (Pteris aquilina L.), W. G. SMITH (*Bot. Soc. Edinb. Trans. and Proc., 30 (1927-28), pt. 1, pp. 3-12, figs. 2*).—Control studies by the Edinburgh and East of Scotland College of Agriculture demonstrated that cutting of bracken fern when the fronds were from 8 to 10 weeks above ground (about July 1 in the cases cited) occurred when formation of fronds had used up the most food reserve in the rhizomes before they could replenish the loss. Cutting induces development of buds normally dormant for a year or longer and when continued gradually exhausts the rhizomes until the older parts die away. Application of crushed rock salt (2 cwt. per acre) when fronds were emerging resulted in a noticeable reduction of fronds by sheep. Sodium chlorate as solution or dry crystals effectively destroyed young fronds.

Sulphuric acid spray: A practical means for the control of weeds, J. G. BROWN and R. B. STREETS (*Arizona Sta. Bul. 128 (1928), pp. 299-316, figs. 6*).—A practical discussion is given of the use of sulfuric acid spray as a weed killer, methods of preparation and application, and costs and merits of the sulfuric acid spray as a herbicide. Spray tests with different concentrations of sulfuric acid led to the following recommendations: Two per cent of acid spray for puncture weed (vine), careless weed (young plants), field mustard, ground cherry, prostrate pigweed, miasma weed, and alkali bee plant (*Wislizenia refracta*); 3.5 per cent for lamb's quarters. yellow sour clover, knotweed, and croton; 5 per cent for silverleaf, horse nettle, sunflower, rayless goldenrod or burro weed, dodder, sow thistle, careless weed (large plants), and bata mata (*Baccharis glutinosa*); 8 per cent for bindweed, Bermuda grass, barnyard grass, green foxtail, and stink grass; and from 10 to 15 per cent of acid for Johnson grass and nut grass.

Recent developments in the use of herbicides in California, E. JOHNSON (*Calif. Dept. Agr. Mo. Bul., 17 (1928), No. 1, pp. 7-16, figs. 4*).—This review of studies on the chemical control of weeds discusses the use of carbon disulfide to destroy creeping perennials, soil sterilizers, remote penetration by soluble arsenicals, sodium chlorate, selective sprays, and oil emulsions.

HORTICULTURE

[Horticultural investigations at the New York State Station] (*New York State Sta. Rpt. 1928, pp. 20, 21, 33, 34, 39, 40, 51-56*).—In the customary manner (E. S. R., 58, p. 835) brief reports are presented for various projects.

Pot experiments in the greenhouse with 1-year-old Hubbardston apple trees again indicated the desirability of a nutrient solution of low concentration in which phosphorus is relatively low and nitrates and magnesium relatively high. In higher concentrations the detrimental effects of high phosphorus were very evident. Trees prospered better without sulfur than without any other of the essential elements. Trees grown in the absence of calcium and phosphorus made very little growth.

Observations on the results of fertilizing Delicious nursery apple trees showed no apparent differences due to treatment. Concerning the effect of green manure crops in improving nursery soils it was found that soils responded markedly to fertilization, as measured by the effect on the green manure crop. The value of fertilizer in producing larger green manure crops rather than in direct fertilization of the trees was indicated, as was also the value of rotating tree crops with other crops supplying large amounts of organic matter. Nitrogen fertilizers markedly increased yields and terminal growth in a bearing McIntosh orchard near Hall.

Studies in spray residue removal led to the recommendation that removal take place as soon as possible after harvesting. The immersion of apples for 1 minute in a solution containing 1 part of hydrochloric acid to 500 parts of water is suggested. The amount of arsenic on cherries was reduced from 0.02+ grains per pound of fruit to a negligible quantity by washing in water for from 10 to 30 minutes. Water was practically as effective as dilute hydrochloric acid. The washing methods employed at canning factories were highly effective.

A tabulation of the number of varieties and distinct species of fruits under test is presented. Of 80,000 seedlings bred at the station, over 41,000 have fruited, and of these, 90 varieties, including 31 apples, 6 pears, 4 plums, 2 cherries, 1 nectarine, 17 grapes, 13 raspberries, 1 gooseberry, and 15 strawberries, have proved meritorious. A total of 42 herein named are now available.

Three propagation experiments were concluded at the end of the year. In the first no differences were found between budded and grafted apple trees of the same variety. In the second apple trees on French crab were found better than trees top-worked on Northern Spy. In the third no significant differences were found between apple trees propagated from buds taken from high and low producing parents.

Spraying materials recommended for 1929, W. C. Dutton (*Michigan Sta. Quart. Bul., 11 (1928), No. 2, pp. 57–59*).—A discussion of the use of various oil, sulfur, calcium arsenate, and proprietary spraying materials, with reference in particular to their efficacy and safety in use.

Analyses of materials sold as insecticides and fungicides during 1928, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 478 (1928), pp. 14*).—According to the usual procedure (E. S. R., 58, p. 738), the results are herein presented of analyses of insecticidal and fungicidal materials collected during 1928.

Standard descriptions of vegetables: Peas, T. F. Ritchie (*Canada Dept. Agr. Bul. 107, n. ser. (1928), pp. 51, figs. 24*).—Technical descriptions are given of the plants, flowers, pods, and seed of 22 varieties of garden and canning

The growth status of the tomato as correlated with organic nitrogen and carbohydrates in roots, stems, and leaves, G. T. Nightingale, L. G. Schermerhorn, and W. R. Robbins (*New Jersey Stas. Bul. 461 (1928), pp. 38, figs. 26*).—Studies with Marglobe tomato plants grown in sand cultures with and without nitrogen and subjected to differential light treatments indicated that the roots and leaves are not primarily storage organs but that in the stems as a whole, exclusive of the growing tips, there may be an accumulation of reserve foods. There was noted a consistent relationship between the plants in the several series, dividing the plants into four general classes in respect to composition, growth, and fruiting comparable to the classification suggested by Kraus and Kraybill (E. S. R., 40, p. 40).

The roots of the several series, as shown by microchemical tests, differed very little in content of reducing substances, sucrose, and starch. The very high content of protein nitrogen found in the roots is believed associated with the fact that the tomato roots are largely fibrous and of meristematic tissue. Stem tips also contained a relatively high percentage of protein. The petioles and the veins of the leaves were similar to the stem in percentage composition and in respect to quality of carbohydrates and organic nitrogen. The leaf blades, though showing a similar trend to the petioles and veins, were characterized by a very high percentage of assimilated nitrogen as protein. It is suggested that the blades may be active factors in certain phases of nitrogen assimilation.

After a period in darkness there was observed a decrease in protein nitrogen and an increase of nitrate free soluble nitrogen in the blades. There was recorded a general increase throughout the plant during the period of darkness of proteose, basic, amino, amide, and ammonia nitrogen at the apparent expense of protein. In the upper stems these changes also included a decrease in proteose and basic nitrogen. The changes occurring in darkness accompanied a very weak vegetative growth ending in the death of the growing tips of stem and young leaves. When returned to the light before actual injury occurred the plants became strongly vegetative, carbohydrates and proteins increased, and all forms of nitrate free soluble nitrogen decreased.

Attention is called to the very high nitrate content of the lower stems, petioles, and veins, and the very low nitrate nitrogen content of the rapidly elongated upper stems in darkness. A comparable situation has been observed in asparagus (E. S. R., 56, p. 344).

Effect of sunshine and shape of fruit on the rate of ripening of tomato fruits, A. G. Wood (*Plant Physiol., 3 (1928), No. 4, pp. 513–517, figs. 4*).—Studies at the Indiana Experiment Station indicated a high positive correlation between the number of sunshine hours and the number of days required for tomatoes to ripen after they had started to color. The coefficients of correlation for four varieties ranged from a minimum of 0.4±0.066 to a maximum of 0.68±0.053. No significant correlation was noted between shape of fruit and the rate of ripening, though a tendency was observed for the more rapid ripening of ovate fruits. Ovate shape seemed to be correlated with lower weight, with the Marglobe as a striking exception.

The English grass orchard and the principles of fruit growing, A. H. Hoare (*London: Ernest Benn, 1928, pp. 227, pl. 1, figs. 45*).—A discussion upon the culture of cherries, apples, and plums on the grass orchard principle.

Pomology studies [trans. title], V. Pashkevich (*Zap. Leningrad. Selsk. Khoz. Inst.* (*Mém. Inst. Agron. Leningrade*), *4* (*1927*), *pp. 497–544, figs. 8*).—Data are presented on the number of flowers per cluster in varieties of various deciduous tree fruits. In general the number of blooms per cluster varied within a variety but was fairly constant. Nutritional conditions influenced the number of flowers. Phenological records are included.

Self-pollination of fruit trees [trans. title], K. F. Kostina [*Zap. Gosud. Nikitsk. Opytn. Bot. Sada* (*Jour. Govt. Bot. Gard., Nikita, Yalta, Crimea*), *10*

(1928), No. 1, pp. 86, figs. 16; Eng. abs., pp. 78, 79).—In investigations at the Botanical Garden, Nikita, Yalta, Crimea, it was found that peaches, plums, apricots, and cherries divided themselves into two distinct groups in respect to self-fertility. Of 68 peaches only one, the Stanwick Nectarine, proved self-sterile. Plums were about equally divided between fertility and sterility. All of 42 sweet cherries proved self-sterile, but of 29 sour varieties 10 were more or less self-fruitful. Apricots were largely self-fruitful. Apples presented a complete range of fertility but in general were unfruitful.

Stone fruits resulting from self-pollination were essentially the same as normal fruits, but apples were small and frequently seedless. Hand pollination increased the set of covered blossoms. No definite correlation was found between the length of stamens and pistils and self-fertility.

Bud sports of deciduous fruits studied, B. D. DRAIN *(Michigan Sta. Quart. Bul., 11 (1928), No. 2, pp. 78, 79)*.—Over 100 bud sports of deciduous fruits, some better and many inferior to the parents, were located and led to the assumption that such sports are of fairly common occurrence. Propagations which have reached bearing age were found to carry the same offtype fruits.

The winter storage of apples [trans. title], R. GURZHY (R. S. GURSHY) *(Zap. Beloruss. Gosud. Akad. Selsk. Khoz. Im. Okti͡abr. Revoli͡utsii (Ann. Weissruthen. Staatl. Akad. Landw. Gorky), 4 (1927), pp. 59–81, pl. 1; Ger. abs., pp. 80, 81)*.—In storage studies at the Academy of Agriculture, Gorki, White Russia, apples were found to suffer a rapid loss in weight during the early storage period, followed by a slowing down during the later season. Losses varied with varieties from 4 to 16 per cent of the initial weight over a period of five months. Fruits from young vigorous trees and from shaded or diseased trees lost more weight than did fruits from mature, sound, and normally exposed trees. Loss in weight was not correlated with specific gravity, but a relation was observed between weight loss and culture of the orchard and also the characteristics of the skin.

Each variety was observed to have an individual behavior in storage; for example, the Antonovka and Antonovka Kaminitschka were subject to scald. Each variety had a proper time for harvesting in relation to keeping quality. Good keepers included Delaware Winter, English Pippin, Winter Bough, and Antonovka Kaminitschka.

The commercial importance of apple storage is stressed.

A study of the catalase of the fruits of pear varieties, E. L. OVERHOLSER *(Amer. Jour. Bot., 15 (1928), No. 5, pp. 285–306, fig. 1)*.—Determinations at the University of California of the catalase activity of pear tissue at different temperatures indicated that 15° C. gives the most reliable readings. Above 20° there was observed a measurable spontaneous decomposition of the hydrogen peroxide. Boiling for 15 minutes destroyed all catalase activity. A correlation was noted between high catalase activity and high pH values. The catalase activity of pear pulp was influenced by the addition of acid or alkaline reagents, with the maximum activity slightly on the acid side.

In stored pears it was found that the effect of temperature upon catalase activity depended upon the duration of the storage period. At high temperatures catalase activity was soon destroyed, while at zero four varieties showed an increase in activity after 6 months' storage, the pH value being greater than when harvested. Long continued storage at temperatures below zero decreased catalase activity.

The mangosteen in America, W. POPENOE *(Jour. Heredity, 19 (1928), No. 12, pp. 537–545, figs. 3)*.—A discussion of the introduction and distribution of the mangosteen in America, with notes on propagation and culture. The very slight variation observed between seedlings suggest that this form of propagation may be utilized.

Manuring Washington navel oranges, J. L. Provan (*Jour. Dept. Agr. Victoria, 26* (*1928*), *No. 10, pp. 588-593*).—The results of tests in commercial orange orchards in Victoria, Australia, suggested the value of a fertilizer consisting of 1 part sulfate of potash, 1 part bone dust. and 2 parts of nitrate of soda for increasing size, quantity, and yield.

Relation of phosphorus content to shriveling of walnut kernels, A. R. C. Haas and L. D. Batchelor (*Bot. Gaz., 86* (*1928*), *No. 4, pp. 448-455, figs. 2*).—A progressive increase was observed in studies at the Citrus Experiment Station, Riverside, Calif., in the total phosphorus content of Persian walnut kernels in accord with the stage of development. Imperfect or shriveled kernels had practically the same total phosphorus as perfect kernels. Apparently shriveling occurred after the kernels had passed the liquid and gel conditions and were approaching solidity. The authors suggest that shriveling may result from severe competition of the different tree organs for water, during which period the kernel suffers at the gain of other parts. That soil may influence total phosphorus content of kernels is suggested in data on nuts from different localities.

Garden flowers worth knowing, R. M. McCurdy (*Garden City, N. Y.: Doubleday, Page & Co., 1927, pp. XII+311, pls. 39*).—Garden flowers are grouped according to the season of blooming and briefly described and discussed.

Hyacinths for garden and home, H. M. Biekart (*New Jersey Stas. Circ. 203* (*1928*), *pp. 23, figs. 5*).—General information is presented upon types and varieties of hyacinths, outdoor and indoor culture, grades of bulbs, control of insect and fungus pests, and upon breeding.

Observations on cuttings of a variety lilac, W. L. S. Kemp (*Sci. Agr., 9* (*1928*), *No. 4, pp. 216-230, figs. 10*).—In studies with cuttings of cultivated lilacs taken throughout the year, only those cut in June and July while in an active growing condition rooted freely. Cuttings taken in the period extending roughly from mid-September to mid-December developed no activity whatsoever, leading to the suggestion that this is the true dormant period in the lilac. This period was followed by continued dormancy, apparently maintained by low temperature and other conditions unfavorable to growth. Cuttings taken during this later period of enforced dormancy showed active bud development in the early part and bud and callus development in the latter part of the period.

A definite correlation was indicated between bud growth and callus formation. Calluses formed only when buds were present and active, and in general the location of the callus was immediately below the most active bud. Bud growth was, however, not necessarily accompanied by callusing. It is suggested that rooting did not occur in cuttings of resting material because reserve foods were insufficient to provide for the metabolism of dormancy, bud growth, callusing, and rooting. The roots arose entirely from the cambium within the callus. Silver sand (pH 6.9) proved the most successful rooting medium.

FORESTRY

Deforested America, G. P. Ahern (*Washington, D. C., 1928, pp. 79*).—A clear-cut picture is offered of the present-day situation in forestry, with a plea for a strong policy to insure the wise use of the remaining timber and the replanting and protection of the cut-over lands.

Timber may become valuable farm crop, J. C. De Camp (*Michigan Sta. Quart. Bul., 11 (1928), No. 2, pp. 51–54, figs. 3*).—Asserting that farm woodlots comprise nearly 18 per cent of the average farm but yield only 3 per cent of the total farm crop, the author discusses the marketing of sawed-lumber products. which are deemed the most difficult for the average farmer to dispose of profitably. A comparison of stumpage and lumber values during recent years showed that stumpage has risen comparatively slowly as compared with lumber. Of seven hardwoods, namely, red oak, basswood, white oak, yellow birch, elm, sugar maple, and beech, the beech was the slowest growing and the least profitable species, yet beech was found to form a large percentage of the woodlot stands of southern Michigan. It is recommended that red oak, basswood, birch, and maple be allowed to grow into veneer-sized logs, since these species were found to be growing vigorously when they reached the 18-in. log size.

Forest reserve tax laws are not perfect, K. Dressel (*Michigan Sta. Quart. Bul., 11 (1928), No. 2, pp. 65–69*).—A discussion upon the operation of, the Pearson timberland tax act, which defers payment of the major portion of the tax upon growing forests until the time of cutting. Figuring that the cutting tax plus annual taxes amount to more than the existing general property tax, the author believes that the cutting tax should be reduced at least one-half and thereby encourage the wider use of this beneficial law.

Staining living trees on the stump, W. R. Brown (*Jour. Forestry, 26 (1928), No. 7, pp. 883–885*).—A description is given of the procedure of introducing dye into forest trees, together with certain observations upon the results. The dye solution ascended the average tree at the rate of from 5 to 6 ft. per hour, only from 2 to 3 days being required to dye all the live wood of the largest trees. Softwoods were dyed equally as well as hardwoods.

The relation of the stomatal opening to carbon dioxide assimilation in the Norway spruce [trans. title], N. Johansson and M. G. Stålfelt (*Svenska Skogsvårdsför. Tidskr., 26 (1928), No. 3–4, pp. 814–817*).—Experiments with 1-year shoots taken from a large vigorous Norway spruce tree showed a striking correlation between the degree of stomatal opening and the carbon dioxide intake. In a light intensity equal to from 27 to 32 per cent of the maximum available at noon on a clear July day at 77° F., with stomata open 49 per cent of their maximum, carbon dioxide was assimilated at the rate of 0.5 mg. per gram of fresh weight per hour; at 70.1°, with stomata open 61 per cent, 0.66 mg. of carbon dioxide was assimilated; and at 73.4°, with stomata open 79 per cent, the intake was 0.95 mg.

Germinative energy of lots of coniferous-tree seed as related to incubation temperature and to duration of incubation, F. W. Haasis (*Plant Physiol., 3 (1928), No. 4, pp. 365–412, figs. 15*).—Records taken at Johns Hopkins University on the germination of pitch pine (*Pinus rigida*) seeds placed in incubators indicated that a given lot of seed may be classified into groups according to the response of the individual seeds to different sets of temperature and duration conditions. For example, one of five lots of pitch pine seeds was found to be made up of at least three distinct physiological forms, (1) seeds capable of germination in 14 days or less at about 25° C. but not at temperatures about 43°, (2) seeds capable of germination at both 25 and 43° within 14 days or less, and (3) a balance incapable of germination within 14 days at any temperature under the conditions employed. The respective proportions were about 65, 25, and 10 per cent. In the case of seeds germinating at both 25 and 43° the higher temperature resulted in rapid germination but low vigor of the resulting seedlings.

For incubation periods of intermediate length both a high and a low temperature optimum were evident in many of the lots. For example, in a 3-day period the two optima were represented by temperature ranges of 27 to 33° and of 42 to 43°. The phenomenon of double optima was observed also in seeds of red, lodgepole, loblolly, and long-leaf pines and Engelmann spruce and was suggested in Scotch pine and smooth cypress. No indication of double optima was found in rice seeds.

Seedlings versus transplants on the Michigan sand plains, R. G. Schreck (*Jour. Forestry, 26 (1928), No. 7, pp. 906–908*).—Comparisons made in the Huron National Forest of different classes of planting stock showed 2-year seedlings to be the most economical stock to use in large plantings, despite the fact that transplants had a greater survival.

Effect of density on seedling development, J. Higgins (*Jour. Forestry, 26 (1928), No. 7, pp. 909–912*).—Experiments in the Bessey nursery, Nebraska, with western yellow and jack pines showed that thin stands in the seed bed are most profitable as measured in trees surviving at the end of the second year in the field. Of four densities studied, namely, 75, 100, 125, and 150 seedlings per square foot, the best stock resulted from the 75 lot. Of the two species, western yellow pine suffered more severely from crowding.

Factors controlling forest types on the Cloquet Forest, Minnesota, C. W. Corson, J. H. Allison, and E. G. Cheyney (*Ecology, 10 (1929), No. 1, pp. 112–125, figs. 3*).—Mechanical analyses, found to check fairly closely with moisture equivalents, proved a fairly satisfactory means of classifying the upland soils of the Cloquet Forest Experiment Station, Minnesota, into their adaptability to various forest types. Light sand, sandy loam, and loam corresponded quite closely to the existing jack, Norway, and white pine types when the effects of various interfering factors such as fire were given due consideration.

Fires and forest succession in the Bitter Root Mountains of northern Idaho, J. A. Larsen (*Ecology, 10 (1929), No. 1, pp. 67–76*).—Studies in the Bitterroot region of northern Idaho, an area characterized by frequent destructive fires, showed definite stages in the return to the climax forest. Lodgepole pine and western larch usually became established first on severely burned areas, followed in the absence of further fires by a western white pine and Douglas fir type, and finally by the return of the climax forest composed of cedar, hemlock, and grand fir.

Preliminary normal yield tables for second-growth western yellow pine in northern Idaho and adjacent areas, C. E. Behre (*Jour. Agr. Research [U. S.], 37 (1928), No. 7, pp. 379–397, figs. 12*).—Based on data obtained in 83 sample plats located in pure, even-aged stands ranging from 30 to 163 years, yield tables are presented for various aged stands on different quality sites. The mean annual growth in cubic feet and board feet per acre, computed by dividing the total volume by their respective ages, attained a maximum on site 120 at 60 years. For the average site, from 80 to 90, the age of culmination was reached between 90 and 100 years, and this is therefore suggested as the most desirable age at which to cut second-growth western yellow pine.

The trees in even-aged stands such as studied were distributed among the different diameter classes according to the normal frequency distribution. The data for the several tables are graphically depicted according to the alignment chart method devised by Reineke (E. S. R., 58, p. 542).

Checks obtained on the final curves for total cubic-foot yields, basal area per acre, average basal area, and total number of trees showed the tables to be in general conservative, the actual plat values averaging higher than the curves.

Culture of the eucalyptus [trans. title], L. Simões Lopes (*Bol. Min. Agr., Indus. e Com. [Brazil], 17 (1928), No. 2, pp. 210–251, pl. 1, figs. 17*).—Information is given on the botany, species adaptation and utilization, propagation, nursery care, planting, culture, control of pests, etc.

Cultivation of the rubber-bearing plants on the Black Sea shore [trans. title], V. Nikolaev (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad]), 5 (1927), No. 6, pp. 469–471*).—The author records experiments conducted with a large number of rubber-bearing plants in the region of the Black Sea. One of the most promising is *Parthenium argentatum*, since it withstands occasional freezing to a temperature as low as —18° C. (—0.4° F.). Plantings of this species are to be made in Central Asia and Azerbaijan where the climatic conditions are favorable. The author suggests the use of *Scorzonera nervosa*, which contains as high as 10.5 per cent of rubber and grows in regions with a 5-month snow cover and a temperature of —25°.

Anatomy of Australian coniferous timbers, R. T. Patton (*Roy. Soc. Victoria Proc., n. ser., 40 (1927), No. 1, pp. 1–16, pls. 5, figs. 2*).—The results of anatomical studies of the wood of various genera and species of Australian conifers are presented.

A bibliography on woods of the world, G. P. Ahern and H. K. Newton (*Trop. Plant Research Found. [Wash., D. C.] Sci. Contrib. 10 (1928), pp. 77*).—This bibliography places particular emphasis on tropical species, excluding those of the temperate region of North America.

DISEASES OF PLANTS

Plant disease investigations on Long Island (*New York State Sta. Rpt. 1928, pp. 37, 38*).—Brief summaries are given of experiments on the control of blackleg of cruciferous crops. Semipopular accounts of the results of the investigations have already been noted (E. S. R., 59, p. 50), and detailed accounts of the seed treatments are given in Technical Bulletin 137 of the station (see p. 446).

A brief summary is given of investigations conducted to determine the reason for conflicting results on increasing stands of vegetable seed by various seed treatments. It is claimed that with the use of some organic mercury compounds increased stands appear to depend largely upon the conditions under which the seed is planted. If the seed is planted early in the season when soil and weather conditions are unfavorable for germination, seed treatment is likely to increase the stand; but if the seed is planted when conditions for germination are good, there is little or no increase in stand. A full account of the investigations has been published (E. S. R., 59, p. 239).

The successful control of bacterial wilt of cucumbers is reported to have followed spraying with a 2–4–50 Bordeaux mixture containing lead arsenate or by dusting with a lead arsenate-lime dust or with calcium arsenate-gypsum dust. The experiments on which this conclusion is based have been described elsewhere (E. S. R., 59, p. 847).

[Plant diseases, Australia] (*Aust. Council Sci. and Indus. Research Ann. Rpt., 1 (1926–27), pp. 16, 17*).—Work is being concentrated on tomato wilt, which is said to have originated near Melbourne in 1915 and now to have spread to all the tomato-growing States. It is said to have been proved by H. A. Pittman, working under G. Samuel, that the cause is a virus transmitted by the onion or rose thrips (*Thrips tabaci*). The larvae feed on the plants only a few days and then drop off to enter the chrysalis stage. The disease does not manifest itself until after a period of from 16 to 20 days.

Banana bunchy top disease has been studied, and an account of this disease and its causation, by Magee, is noted on page 452. A banana disease, named "squirter," from the ready manner in which the decomposed material may be squeezed out at the end of the fruit, appears to be related to similar diseases in other fruits, as brown heart in apples. Investigations of bunchy top and "squirter" are under the supervision of E. J. Goddard.

Abnormal plant growths (galls), M. S. Dunn (*Amer. Jour. Pharm., 98 (1926), No. 8, pp. 382–396, figs. 6*).—Besides accounts of galls produced by insects and certain other animals, including nematodes, general accounts are given of various abnormal growths produced by the presence, proximity, or activity of low plant organisms. "The exact nature of the stimulus involved in gall formation is not known."

Seed treatment for black-leg disease of crucifers, E. E. Clayton (*New York State Sta. Tech. Bul. 137 (1928), pp. 58, pls. 5*).—The results are given of six years' work on the control of blackleg of crucifers, in which various types of treatment were tested in the greenhouse and in the field.

Various dust disinfectants were tested, and while in a few cases good control was secured in others there was none. The author states that none of the dust treatments can be recommended for use against blackleg.

The liquid chemical treatments included solutions of corrosive sublimate and a number of organic mercury compounds. Seed injury followed some of the treatments. Only the standard corrosive sublimate method is recommended and that to be used only in case of moderate to light disease attacks. In general, the chemical soaking treatments are not recommended.

Experiments were carried on with hot water treatments at 50, 55, and 60° C. for different periods of time, and, on the basis of the experiments, it is recommended that cabbage and Brussels sprouts seed be soaked 25 minutes in water at 50° (122° F.). This proved the most satisfactory protection against blackleg infection. It is further recommended desirable that this work be carried out under some system, such as the central treating station plan, and not by farmers at home.

The relation of certain bacteria to the development of roots, A. J. Riker, W. M. Banfield, W. H. Wright, and G. W. Keitt (*Science, 68 (1928), No. 1763, pp. 357–359*).—The authors have investigated the commonly accepted belief that hairy root is a form of crown gall disease and is caused by *Bacterium tumefaciens*. Previous studies of Riker and Keitt (E. S. R., 58, p. 240) had revealed the presence of malformations on apple roots from which organisms similar to *B. tumefaciens* were isolated that did not produce typical crown gall when inoculated into susceptible hosts. A progress report is given of studies made to establish the identity of these organisms and their relation to the host plants.

Many strains of organisms resembling *B. tumefaciens*, but which failed to produce infection on tomato stems, were inoculated into 1- or 2-year-old grafted apple trees of the Wealthy variety. At the end of the growing season no typical crown gall or hairy root was observed, but in certain cases small enlargements or sparse root developments occurred at the places of inoculation. In later experiments, similar inoculations were made into underground parts of the current year's shoots from the scions of newly set grafts as they developed in the nursery. After a period of incubation of approximately 6 weeks, fleshy roots were found at the places of inoculation. No root development or other malformation occurred about the punctures on control plants. In repetitions of this experiment in the field and in the greenhouse, 15 strains of bacteria of this type have been inoculated into young shoots of apples, and every strain stimulated root development. Enlargements at the bases of these root developments yielded cultures which appeared on agar plates to be typical of the culture from which the inoculation had been made, and reinoculations were made with each of the strains reisolated. In connection with these experiments, similar inoculations were made from cultures of typical highly pathogenic *B. tumefaciens*, and in every case crown gall developed, but in no instance was there any evidence of root stimulation.

It is claimed that although the work is incomplete the data indicate certain important differences between the root-stimulating cultures and the typical gall-inducing *B. tumefaciens*. The differences were found to relate both to physiology and pathogenicity and are considered as probably specific.

Zonate eyespot of grasses caused by Helminthosporium giganteum, C. Drechsler (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 8, pp. 473–492, pls. 8, figs. 3*).—In previous publications the author gave an account of various species of Helminthosporium found on grasses, and he reported the occurrence of *H. giganteum* on a number of grasses in addition to the species previously reported (E. S. R., 49, p. 747; 53, p. 848). In the present paper the degree of injury to the grasses is discussed, and some of the morphological and other features of the fungus are described.

While generally occurring throughout the Southern States, *H. giganteum* has been found in quantity as far north as Maryland and Missouri. The fungus is considered to overwinter in the form of dormant mycelium, fresh conidiophores and conidia being produced in the late spring from the morbid parts of old foliage infected during the previous season.

Sporulation of the fungus occurs on the larger tracts of killed tissue, resulting either from the coalescence of numbers of individual eyespot lesions or from secondary development of such lesions. As in various hosts the newly infected parts are delimited by marginal coloration, the repetition of such development is said to bring about a characteristic zonate appearance.

Among the hosts on which the parasite propagated itself under natural conditions, the author enumerates 11 species of grasses. It was observed in meager quantity on 2 additional species, and lesions due to infection by conidia of the parasite were observed on 11 other species when the grasses occurred in proximity to more congenial hosts.

Susceptibility of wheat to mildew as influenced by salt nutrition, S. F. and H. M. Trelease (*Bul. Torrey Bot. Club*, *55* (*1928*), *No. 1, pp. 41–68, pls. 2, figs. 4*).—Marquis wheat showed pronounced differences as regards susceptibility to mildew, *Erysiphe graminis*, between plants grown in different culture solutions. On the basis of dry yields, the least susceptible plants were secured by use of a solution having 90 per cent KH_2PO_4, 5 per cent $Ca(NO_3)_2$, and 5 per cent $MgSO_4$ (total concentration 0.02 gram-molecule per liter). The most susceptible plants were those obtained from the use of solutions containing 5 per cent KH_2PO_4, 47.5 per cent $Ca(NO_3)_2$, and 47.5 per cent $MgSO_4$ (total concentration 0.02 gram-molecule per liter).

Host vigor and susceptibility to mildew appear not to be closely correlated. The conclusions are regarded as applicable only in the case of such conditions as were present during the course of the work here reported.

A wilt disease of alfalfa caused by Fusarium oxysporum var. medicaginis, n. var., J. L. Weimer (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 7, pp. 419–433, pls. 2, figs. 3*).—A detailed account is given of an investigation of a wilt disease of alfalfa, the occurrence of which has been previously noted (E. S. R., 59, p. 845).

The disease, which is said to be similar to other Fusarium wilt diseases, is known to occur in Mississippi and is suspected to be present in California. The leaves of affected plants are said to turn yellow, the tips of the stems frequently wilt, and the plants eventually die. The vascular region of diseased plants, especially of the taproot, is generally some shade of brown. This wilt is said to resemble the bacterial wilt due to *Aplanobacter insidiosum*, but it may be readily distinguished from it. The causal organism is described as *F. oxysporum medicaginis*, a technical description of which is given.

No control measures have been worked out by the author.

A Pythium seedling blight and root rot of dent corn, H. Johann, J. R. Holbert, and J. G. Dickson (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 8*, *pp. 443–464*, *pl. 1*, *figs. 9*).—The authors give a detailed account of an investigation of an injury to corn caused by *P. arrhenomanes*, recently described by Drechsler (see below).

The authors claim that Pythium injury to corn may be manifest as a rot of the embryo, preventing germination; as a seedling blight after emergence; or as a root rot that tends to reduce the size, vigor, and yield of the maturing plant. The fungus *P. arrhenomanes* is said to attack the mesocotyl of the seedling only in the late stages of the disease, and then only in cases of severe attack. Infection takes place at the tip of the rootlet, and it produces a soft rot that involves first the cortex and later the vascular elements. Experiments with the fungus in which open-pollinated and inbred corn was inoculated at the time of planting in soil-temperature control tanks are said to indicate that soil temperatures near 16° C. (60.8° F.) or lower, together with high soil moistures, are so favorable for infection that germination of corn kernels may be prevented or seedling blight produced. When inoculated corn was not killed in the seedling stage, the height and dry weight of the tops of the plants were reduced. Evidences of differing degrees of resistance or susceptibility were found in different inbred strains of corn.

Field experiments during three seasons are said to confirm the results obtained in the greenhouse.

Pythium arrhenomanes n. sp., a parasite causing maize root rot, C. Drechsler (*Phytopathology*, *18* (*1928*), *No. 10*, *pp. 873–875*).—A technical description is given of *P. arrhenomanes*, the cause of a decay of maize roots in Wisconsin.

Some effects on Pisum sativum of a lack of calcium in the nutrient solution, D. Day (*Science*, *68* (*1928*), *No. 1766*, *pp. 426*, *427*).—Canada field peas grown in sand cultures showed a definite response to variations in the amount of calcium supplied in the nutrient solution. Plants deprived of calcium had shorter stems, chlorotic lower leaves, and curled and tough upper leaves. Both the green and the dry weight decreased as the amount of supplied calcium decreased. Plants without calcium died at the end of 9 or 10 weeks. The application of calcium to plants starved for this element for 5 weeks resulted in a rapid recovery. Apparently the calcium in the seed was utilized in the early stages of growth. No influence of calcium upon the anatomical structure of the stem and roots was noted.

A study of twenty-four strains of Actinomyces and their relation to types of common scab of potato, W. A. Millard and S. Burr (*Ann. Appl. Biol.*, *13* (*1926*), *No. 4*, *pp. 580–644*, *pls. 6*, *figs. 2*).—"In a previous paper [E. S. R., 46, p. 450] attention was directed to the fact that various strains of Actinomyces, pathogenic to potatoes, showed differences in culture which could not be accounted for if all the strains were to be regarded as belonging to the single species *A. scabies*. In the absence of any detailed cultural examination, the so-called 'strains' were assumed for the time being to fall into a hypothetical '*A. scabies* group,' but the suggestion was made that they might be distinct species each able to produce 'scab.' It may now be pointed out that in addition to the cultural differences existing among the strains, an even greater discrepancy occurred between the strains as a group and the original scab-producing organism (*Oospora scabies*) as described [and otherwise dealt with] by Thaxter [E. S. R., 2, p. 490; 3, p. 9]. This description is brief, and, in view of subsequent knowledge of the Actinomyces group, is of little use for purposes of exact comparison."

The difficulty of reconciling various cultures of the scab organism with any one defined type of *A. scabies* is discussed, and inclusion of all such cultures into one *A. scabies* group is thought to have no justification. A technique has been evolved whereby the cultural characters of Actinomyces may be maintained in subculture. Twenty-four Actinomyces strains were isolated from potato scabs and other sources, and the cultural and morphological characters of these were worked out and described. Three pairs of duplicate strains appeared, otherwise the differences between the strains were of specific rank. One of the species appears identical with Thaxter's original scab organism and is thus referred to *A. scabies*. The remainder are thought to be new and have been named. Eleven of the species produced scab on potatoes. The various types of common scab have been defined, and it is claimed that scab type is dependent on the infecting Actinomyces species, the potato variety modifying but not materially changing the type.

"*A. scabies* . . . produced a deeply furrowed scab apparently identical with the 'deep scab' described by Thaxter. This species was also found to attack the roots and stolons of potato plants." A discussion is given of scab occurrence in virgin soils and the predominance of certain scab types in certain soils and in different years.

Notes on experiments relating to loss of vigour in stocks of potatoes, W. J. MEGAW (*Jour. Min. Agr. North. Ireland, 1 (1927), pp. 37–45, pls. 3*).—In an early district, such as Dundonald, potato stocks tend to deteriorate rapidly, particularly late varieties, this fact requiring frequent changes of seed. In later districts the deterioration rate is relatively slow, and in such districts healthy stocks can be grown to provide suitable changes of seed for the earlier districts.

The appearance of leaf roll or mosaic (more especially the former) to any serious extent in a potato crop is a certain indication that a change of seed is necessary.

A new Rhizopus rot of rutabaga, M. L. DAWSON and A. H. POVAH (*Science, 68 (1928), No. 1753, p. 112*).—A typical wet rot of rutabagas caused by *R. fusiformis* n. sp. is described. A technical description of the organism is also given.

Inoculation experiments showed that the organism produced typical wet rot in carrot, cucumber, eggplant, green pepper, Hubbard squash, onion, pumpkin, sweet potato, and tomato.

Tomato mosaic: Filtration and inoculation experiments, H. R. KRAYBILL and S. H. ECKERSON (*Amer. Jour. Bot., 14 (1927), No. 8, pp. 487–495, pls. 2*).—"In order to learn more about the infective principle of tomato mosaic, the juice of mosaic plants was separated by filtration methods, and healthy tomato plants were inoculated with the different fractions. . . .

"The mottling principle of tomato mosaic did not pass through the fritted glass filters when colloidal substances were present in the juice, but did pass through in part when the colloids had been partially removed before filtration. The substance producing fernleaf was separated from the mottling principle of tomato mosaic by filtration through collodion membranes and by filtration of the colloid-containing juice through fritted glass filters."

Fruit disease investigations in the Hudson Valley (*New York State Sta. Rpt. 1928, p. 33*).—It is stated that attempts to rejuvenate sick apple and pear trees by the use of nitrogenous fertilizers and pruning top growth to balance weakened roots are showing greater promise of success than at any time since the work was begun. On the other hand, bridge grafting of crown-injured trees was less successful during the past two years than formerly.

A close relationship is suspected between insect attack and winter injury. Kieffer pear trees badly infested with the pear psylla in 1927 are said to have developed black heart and brown, shriveled buds and bark within two weeks after the severe cold in January, 1928. Similar, but less severe, injury is said to have occurred on Rome Beauty and Cortland apples heavily infested with green aphis in 1927.

Studies on the fungus causing apple scab are said to have shown that in the spring of 1927 and again in 1928 the fungus overwintering on fallen leaves provided scant inoculum during the early stages of apple growth. In the study of spraying materials, lime-sulfur solution and Bordeaux oil mixture continued to show most favorably for the early applications. Experiments with zinc sulfide were brought to a conclusion because of manufacturing difficulties. For the late applications, lime sulfur and Jersey dry mix have given the best results. In 1928 lime sulphur caused severe foliage injury. Fungicides containing copper caused russeting of the fruit, both in 1927 and 1928.

Studies on fire blight: Host range, H. R. ROSEN and A. B. GROVES (*Jour. Agr. Research [U. S.], 37 (1928), No. 8, pp. 493–505, figs. 5*).—The authors describe the results of artificial inoculations with *Bacillus amylovorus* of the Japanese quince, Vanhoutte spirea, and Burbank plum, all of which are new hosts for the organism, and they confirm the susceptibility of the cultivated rose to infection.

A list of 58 species of known host plants is presented.

Defoliation of cherry trees in relation to winter injury, W. O. GLOYER and H. GLASGOW (*New York State Sta. Bul. 555 (1928), pp. 27, figs. 8*).—In 1928, the Montmorency cherry trees in western New York were reported to have suffered defoliation to a considerable extent through a physiological disease known as yellow leaf or by leaf spot caused by *Coccomyces hiemalis*. Variation in leaf cast was noted on trees in the same orchard, the more vigorous ones showing the least defoliation.

Studies were made on the control of the leaf spot, and when applications of lime sulfur, with and without lead arsenate, were made it was found that the application made 10 days after petal fall could not be omitted without incurring risk of defoliation of the cherry trees by the leaf-spot fungus.

Where the fungus was controlled, defoliation by yellow leaf was observed, especially on the less vigorous trees. A close relationship was found to occur between this type of defoliation and winter injury of the roots.

The relation of defoliation of trees to their vigor was investigated, and the time of defoliation was found to have an important bearing on winter injury. In some cases branches were winterkilled that had an insufficient amount of stored food material. The winter injury in 1928 is considered to have been associated with defoliation caused by the leaf spot. In general, the later in the season that defoliation occurs, the less the injury to the following crop.

The control of American gooseberry mildew in Northern Ireland, A. E. MUSKETT and E. TURNER (*Jour. Min. Agr. North. Ireland, 1 (1927), pp. 45–67, pl. 1*).—A brief history is given of the so-called American gooseberry mildew in continental Europe and Great Britain, with a detailed account of experiments for the control of the disease.

It is stated that American gooseberry mildew in Northern Ireland can be satisfactorily controlled by spraying. Two applications of polysulfide sprays have proved to be sufficient. The first, which is considered as very important, should be applied immediately after flowering, and the second three weeks later.

Ammonium polysulfide with soft soap gives the best results. These are followed closely by those obtained by using lime sulfur with skim milk or flour paste as a spreader and sticker. Skim milk and flour paste are better and cheaper than the proprietary spreaders used. Lime sulfur-lead arsenate and also ammonium polysulfide-lead arsenate sprays can be used with no risk of injury to Whinham Industry bushes if a little freshly slaked lime is added. Either of these combined sprays controls the mildew, also the damage done by the larvae of the gooseberry sawfly. The lime sulfur-lead arsenate combination has more fungicidal value than lime sulfur used with a spreader.

After five seasons' work in a badly infected plantation a certain cumulative effect of spraying has been noted. Control of the disease on rapidly growing young bushes is more difficult than on mature bushes which are still making a fair amount of young growth.

Washing soda (1 oz. per gallon) used with a spreader proved of little value. One spraying late in February with caustic soda gave better control than two sprayings in the summer with washing soda. The best control, apart from that due to polysulfides or colloidal sulfur, was obtained by using caustic soda once in February and washing soda twice in the summer. Skim milk with washing soda gave better results than did any of the proprietary spreaders.

Polysulfide sprays may be used on Whinham Industry, Crown Bob, Whitesmith, Red Warrington, and Keepsake, though spray injury on the last has been noticed. Amber bushes and other Sulphur varieties can not be treated with polysulfides, and for these one spraying with caustic soda in February followed by two with washing soda in summer is recommended. Mutton bushes from Long Ashton cropped well and showed more resistance than did Whinham Industry bushes. The American varieties Charles, Sylvia, and Mabel remained disease free, but gave crops poor in quantity and in quality.

The cost of spraying for the most promising spray fluids used ranged from 4 to 7.5 per cent of the crop value during the four years of experimentation.

The control of American gooseberry mildew, R. M. Nattrass (*Jour. Min. Agr.* [*Gt. Brit.*], *33* (*1926*), *No. 3*, *pp. 265–268*).—Though American gooseberry mildew has now been present in England for a quarter of a century, the control methods are not yet regarded as satisfactory, and investigations looking to the control of this disease have been added to the program of work adopted by the Long Ashton Research Station.

During the spring and summer of 1925, comparative trials of four washes were carried out on a commercial scale near Cheltenham. While the control obtained was striking, the experiment is regarded as preliminary, requiring further tests. Whinham Industry, said to be particularly susceptible to American gooseberry mildew yet fairly resistant to spray injury, was chosen for the tests, the details of which are given.

Very good results were obtained in these limited experiments with ammonium polysulfide and soft soap, with soda-sulfur compound and soft soap, and with washing soda and soft soap. The time of the first application is considered important. This application should be made as soon as the flowers have set, though on April 28 in these experiments no sign of the disease could be seen. Small infection centers, originating from the winter spores, are thought to have been present though invisible to the naked eye, since the control bushes were heavily infected before the second application was made on June 5. In the case of the plat in which the first application was made after the mildew had become visible, rather poor control was obtained. It is regarded as essential that the spraying should commence before the disease can be seen.

Raspberry disease investigations (*New York State Sta. Rpt. 1928, pp. 32, 33*).—Two seasons' records on a large planting of Plum Farmer raspberries are said to show wide variations in the degree of injury and type of symptoms produced by the red raspberry mosaic, yellow mosaic, mild mosaic, and streak. Red raspberry mosaic and yellow mosaic are said to have spread rapidly in the planting, and both of these diseases are reported as becoming more prevalent in commercial black raspberry plantings.

The progressive stages and variations in the symptoms were studied in more than 300 inoculations of pure strains of different raspberry viruses, as well as many natural infections, to determine a more accurate basis for control by roguing and for studies on resistance of varieties.

Investigation on the bunchy top disease of the banana, C. J. P. Magee (*Aust. Council Sci. and Indus. Research Bul. 30 (1927), pp. 64, pls. 22*).—This bulletin, dealing with the scientific aspect of the banana bunchy top disease and resulting from investigations instituted by the Governments of the Commonwealth of Australia, New South Wales, and Queensland, is stated to have been issued as the work of the author, "since the knowledge of the nature and mode of transmission of the disease is mainly the result of investigations carried out by that officer." A general report dealing with the problem has been noted (E. S. R., 57, p. 851), and further investigations regarding certain aspects are stated to be still in progress This disease is said to have been the most serious banana malady in Australia and to have caused serious losses in Fiji, Ceylon, and Egypt.

The bulletin outlines or details information on the history of the disease in Australia, its economic effects, distribution, hosts and their susceptibility, common names of the disease. symptoms, causation and transmission, observations on the banana aphis, ecology of the disease, and control measures.

No plant outside the genus Musa has yet been found susceptible to bunchy top, but all bananas are susceptible, and Cavendish, the standard Australian commercial variety, is very susceptible. The symptoms are described. The characteristic streaking is correlated with a pathological condition of the phloem region of the vascular bundles. The disease induces a disorganization of the root system. No bacterium, fungus, or protozoan has been found as a causal agent, but definite evidence indicates that bunchy top can be transmitted by the banana aphid (*Pentalonia nigronervosa*). It is distinctly systemic and belongs with the virus diseases of the potato leaf roll type. Exclusion and eradication are the only remedies. No other measures are protective, and no immune or even resistant stock is available.

Notes on the stem eelworm, W. E. H. Hodson (*Jour. Min. Agr.* [*Gt. Brit.*], *33 (1926), No. 3, pp. 259–262*).—It is deduced from brief notes presented that, "while in the case of attack by one strain on a particular host it would be safe to follow with another crop known to be a host of the eelworm, the same would not hold good if it happened to be a generalized form of the pest that was causing the damage. The extent to which such a transfer is likely to occur is governed, to a very large degree, by the time during which the strain has confined its attack to the original host. In cases where information on this point can be obtained—and such cases are by no means as uncommon as might be supposed—the course of action may be determined accordingly. In cases in which the eelworms are known to have been on one particular crop for two or more years, the attack on other potential hosts is likely, at least during the first year, to be so slight as to be negligible. From this it is seen that as a general rule it would be safe to put down clover after, say, an oat crop attacked two years running on the same ground; but, if the clover was destined for a two or three years' ley, it might possibly be seriously attacked toward the end of the period, as the pest became more accustomed to the new host."

ECONOMIC ZOOLOGY—ENTOMOLOGY

Insects: The people and the State, H. T. Fernald (*Sci. Mo., 27 (1928), No. 3, pp. 193–205*).—An address presented at the annual meeting of the American Association of Economic Entomologists, at Nashville, Tenn., in December, 1927.

[Studies of economic insects at the New York State Station] (*New York State Sta. Rpt. 1928, pp. 44–51*).—This is a report of the work of the year considered under the headings of the several fruits and vegetables attacked.

Experiments conducted with the rosy apple aphid, together with similar work in 1925, pointed to the following conclusions: "(1) Aphid eggs are more resistant to treatment than newly hatched nymphs. (2) A higher degree of control may be expected from mixtures applied when the tips of the leaves are projecting as much as 0.5 in. than when the treatments are made when buds are dormant or in the green-tip stage. (3) Lime sulfur with nicotine sulfate is an effective spray if carefully applied. (4) Aphid infestation is noticeably reduced by tobacco dust or Derrisol. (5) The aphiscidal properties of oil sprays varies with the oil content as does also the danger of injury. Mixtures containing 3 per cent oil reduced the amount of injury by the rosy apple aphid, but the protection afforded the trees has not been as satisfactory as that usually obtained with either lime sulfur and nicotine or the Bordeaux-oil spray with nicotine." It was found that in order to secure a high degree of control from oil alone it is necessary to increase the ratio of oil, 4 per cent being the minimum recommended.

Studies of the codling moth showed that there may be a large carry over of caterpillars in cold storage houses. When thus carried over the moths did not make their appearance until temperatures inside the rooms rose to 68 or 70° F., or approximately 3 weeks later than the appearance of the moths reared under normal conditions in adjoining apple orchards. It is concluded that the occurrence of a large number of belated individuals originating in warehouses or in other situations where there have been large accumulations of apples, especially cull fruits as used for the manufacture of cider or vinegar, would constitute a menace to neighboring orchards and neutralize to an important extent the beneficial effects of customary spray practices.

The peach cottony scale (*Pulvinaria amygdali* Ckll.), which caused considerable apprehension to peach growers in Niagara, Orleans, and Monroe Counties in 1925 and 1926 (E. S. R., 59, p. 250), was of minor importance during the year. The oriental peach or fruit moth (*Laspeyresia molesta*) was discovered in Niagara County during the year, the infestation centering around Westfield.

In work with the cucumber beetles on Long Island it was found that the efficiency of squash seedlings as traps depended on dusting or spraying the main crop to repel the beetles, and on the fact that the main crop had not commenced to blossom. Such blossoms were highly attractive to beetles and nullified to a great extent any measures taken to repel them. The most successful means taken to kill cucumber beetles was the use of a 3 per cent nicotine-hydrated lime (dolomite) dust in heavy dosages. The efficiency of the dust depended entirely on obtaining thorough contact with the beetles. To insure this squash seed was sown weekly for three weeks, thus supplying a succession of seedling plants and eliminating foliage interference. Comparative tests with spray and dust mixtures as repellents showed that arsenical dust mixtures were less toxic to plant growth than nicotine dusts. Those containing gypsum were more beneficial than those containing lime. An arsenical spray mixture containing kayso as a sticker gave superior results to that containing fish oil.

In control work with potato insects on Long Island there was an improvement in the condition of foliage and a marked increase in yield where a 3 per cent nicotine dust had been applied on plants previously dusted or sprayed.

The cabbage maggot was the most injurious insect to cauliflower seed beds during the year. Of numerous materials tested to control the pest, mercuric bichloride 1 to 1,250, Uspulun 1 to 400, and sodium fluosilicate 1 to 250, in aqueous solutions, gave the best results.

Climatic influence on citrus insect distribution in California, R. S. Woglum (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 708–715, fig. 1*).—It is pointed out that citrus fruit pests in California occur in more or less well-defined areas. Some species are most destructive under the cooler temperatures near the ocean, and others are destructive only where the summer weather is hot and dry. There are also intermediate types. The distribution of these pests in 1927 is compared by the author with that of 1907. An attempt has been made to designate the maximum temperatures and the minimum humidities which appear to limit the destructiveness of the more important citrus pests.

Insects vs. poliomyelitis: Negative evidence, R. W. Doane (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 693–697*).—A study made early in 1928 during the course of an epidemic of poliomyelitis on the Stanford University campus led to the conclusion that insects were not implicated in the spread of the disease.

Present status of certain insect pests under biological control in Hawaii, O. H. Swezey (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 669–676*).—An account is given of the present status of some of the natural enemies successfully introduced into Hawaii for the biological control of insect pests.

Methods of preparing nicotine extracts from tobacco dust (*New York State Sta. Rpt. 1928, p. 39*).—By soaking 40 lbs. of tobacco dust containing 1 per cent of nicotine in 100 gal. of water for 24 hours with occasional stirring, an extract containing 0.04 to 0.05 per cent nicotine, or about 70 per cent of the total nicotine present in the tobacco, could be obtained. By using 8 lbs. of 5 per cent nicotine tobacco dust, an extract is obtained of the same nicotine concentration, about 90 per cent of the total nicotine present in the tobacco.

Specifications for petroleum oils to be used on plants, E. R. de Ong (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 697–702*).—The author finds that certain of the older specifications for defining petroleum lubricating oils, such as flash point, color, and gravity, are apparently of little value for evaluating oils suitable for spraying purposes. In place of these, other characteristics including sulfonation value, volatility, and oxidation value are defined and laboratory methods given for determining them.

The effect of certain hard waters on the stability of cold mix lubricating oil emulsions, J. R. Eyer and F. M. Robinson (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 702–707, figs. 2*).—" In an attempt to ascertain the cause for separating out of 'cold mix' oil emulsion stocks on dilution with certain of the hard waters in New Mexico, it was found that a modification of Herschell's demulsibility test could be applied for determining the rate of separation in these mixtures. This test, when applied to oil emulsions made from hard waters containing magnesium sulfate in amounts greater than 5 parts per 100,000, showed that the separating out of the oil was in proportion to the amount of magnesium sulfate present, leading to the conclusion that this chemical was largely responsible for the instability of the emulsions in the types of water observed. Calcium sulfate and sodium chloride, also normal constituents of New Mexico hard waters, did not affect the stability of emulsions."

Some factors affecting the toxicity of hydrocyanic acid for insects, F. J. Brinley and R. H. Baker (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 53 (1927), No. 3, pp. 201–207, figs. 4*).—This is a report of a study made of the toxicity of hydrocyanic acid for insects, work having been conducted with *Aphis rumicis*, the chrysanthemum aphid, the onion thrips, the granary weevil, and the rice weevil.

The results of over 1,000 experiments indicate that, within certain limits, concentration and length of exposure are inversely related or that toxicity= concentration×the time. The higher the temperature the more susceptible were the insects, their susceptibility being more pronounced with the shorter exposures. "Present indications are that humidity is not an important factor affecting the toxicity of hydrocyanic acid. Comparative studies on calcium cyanide and liquid cyanide show that the liquid hydrocyanic acid is more toxic than the gases from hydrolysis of calcium cyanide. A small amount of methyl acetate added to liquid hydrocyanic acid seemed to increase the toxicity of the gas arising from the liquid hydrocyanic acid, which may be due to the fact that a small amount of methyl acetate kept the spiracles open, while in pure hydrocyanic acid the spiracles were quickly closed."

Carbon dioxide a chemical accelerating the penetration of respiratory insecticides into the tracheal system by keeping open the tracheal valves, E. H. Hazelhoff (*Jour. Econ. Ent., 21 (1928), No. 5, p. 790*).—The author considers it probable that the increased susceptibility to hydrocyanic acid in higher temperatures, as observed by Brinley and Baker (see above), is explained by the influence of increased metabolism (and therefore increased output of carbon dioxide) on the width of the spiracle opening.

Studies on the resistance of certain insects to hydrocyanic acid, A. M. Boyce (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 715–720*).—In this contribution from the California Citrus Experiment Station the author briefly reviews instances of resistance or increased tolerance of insects to insecticidal treatment. He reports upon a study being made of the development of resistance to hydrocyanic acid gas of several species of insects, and presents the results of fumigation experiments with *Drosophila melanogaster* Meig. and the cotton or melon aphid.

Composition of fluorides and fluosilicates sold as insecticides, R. H. Carter and R. C. Roark (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 762–773*).—"Samples of fluorides and fluosilicates representing the products of 14 manufacturers in the United States were examined chemically and microscopically. Both of these materials may be obtained in a satisfactory degree of purity. In solution all the fluosilicates give an acid reaction, whereas the sodium fluorides show a neutral or alkaline value.

"It is believed that the observed variations in the apparent toxicity to insects of different brands of commercial sodium fluosilicate are owing to factors other than variations in fluorine content. Variations in size of crystals cause variations in cubic inches per pound, dusting qualities, adhesiveness, and rate of solution, properties which greatly influence the efficacy of a dust insecticide. Variations in foliage-burning properties of different brands of commercial sodium fluosilicate are likewise probably the result of variations in crystal size."

Experiments on control of Eutettix tenellus (Baker), E. A. Schwing (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 790, 791*).—The author concludes that the emulsion 25 per cent Fly Spray, 75 per cent whale-oil soap, and water 29 parts or less is an economical spray for beet field application. Nine years of continual foothill observations are said to have convinced him that it is possible to reduce the beet leafhopper on the west side of the San Joaquin Valley considerably by trapping on preirrigated sugar beet patches of 5 acres each and a mile apart, and that killing this leafhopper over a period of 4 or 5 weeks is of economic value.

Cotton flea hopper studies of 1927 and 1928, C. O. Eddy (*South Carolina Sta. Bul. 251 (1928), pp. 18, figs. 4*).—This is a report of studies conducted in continuation of those previously noted (E. S. R., 57, p. 163). Following an introduction the author deals with the subject under the headings of the problem in South Carolina, history and future, general weather and crop conditions, seasonal and regional aspect, seasonal history, life history studies (pp. 9–13), cage experiments with seedlings (pp. 13–15), and control.

Damage from the cotton flea hopper was noticed for the first time in the State in 1924, and the injury in 1925 was very small. The injury in 1926 was the greatest ever observed, while that of both 1927 and 1928 was very limited. Cage experiments with seedlings have shown that both nymphs and adults injure terminal buds and cause abnormal and retarded growth. Mechanical injury to terminal buds produced similar growth.

The life history studies of the pest are reported under the headings of records of pairs, longevity, development, and seasonal incubation records. Data on mated females and development of the cotton flea hopper are presented in detail in tabular form.

Clean culture and the destruction of alternate host plants have been found helpful measures in combating the pest. Sulfur prepared as a dust is considered the most effective insecticide that can be applied economically. The sulfur may be mixed with calcium arsenate at the rate of 2 lbs. of sulfur to 1 lb. of calcium arsenate to control both the cotton flea hopper and the boll weevil.

A new genus and species of Aphididae (Homoptera), A. A. Granovsky (*Ent. Soc. Wash. Proc., 30 (1928), No. 7, pp. 113–121, figs. 18*).—In this contribution from the Wisconsin Experiment Station the author erects a genus and describes a form taken from the white paper birch (*Betula papyrifera* Marsh) under the name *Cepegillettea betulaefoliae* n. g. and sp.

Predicting serious cotton aphis infestations, A. L. Hamner (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 736–741*).—The author reports that the results obtained in a season's studies made at the Mississippi Experiment Station indicate that when a cotton aphid infestation as high as 5 per cent exists at the time calcium arsenate dusting for the boll weevil is started, a heavy infestation may be expected if as many as four applications are made.

The introduction of new insect enemies of the citrophilus mealybug from Australia, H. S. Smith and H. Compere (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 664–669*).—In this contribution from the California Citrus Experiment Station, the authors record the successful introduction of six species of natural enemies into California from Sydney, Australia. They are *Tetracnemus* n. sp., *Coccophagus* n. sp., *Diplosis* sp., *Pullus* sp., *Diomus* sp., and *Chrysopa* sp.

A unit system for recording the results of insecticides against the citrus black scale, R. S. Woglum and J. R. LaFollette (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 678–682*).—The authors describe a unit method of orchard inspection for black scale, the unit being the small number of well-developed black scale on a branch 6 to 10 in. long. In determining the comparative value of spray materials only the lower half of the tree is inspected. It is pointed out that the system records with equal accuracy the condition of a single tree, an orchard, or a group of orchards.

On the occurrence in New Zealand of Coleophora fabriciella Villers, S. Lindsay (*New Zeal. Jour. Sci. and Technol., 9 (1927), No. 4, pp. 248, 249, fig. 1*).—This European species has been introduced quite recently into New Zealand, where it may become a pest on clovers.

The azalea leaf miner (Gracilaria azaleella Brants), W. E. H. Hodson (*Jour. Roy. Hort. Soc., 52 (1927), No. 1, pp. 54–59, pls. 2*).—This is a practical summary of information on the azalea leaf miner.

Contributions to the life history of the pine moth, Panolis flammea Schiff., and its parasites [trans. title], H. Sachtleben (*Arb. Biol. Reichsanst. Land u. Forstw., 15 (1927), No. 4, pp. 437–536, pls. 3, figs. 2; abs. in Rev. Appl. Ent., 16 (1928), Ser. A, No. 4, pp. 178, 179*).—This is an extended report of studies of *P. flammea* conducted in 1925 both in the laboratory and the State forest of Zossen, following an outbreak of this pest over wide areas in north and east Germany. The main parts of the work deal with the biology of the insect (pp. 440–472) and its insect parasites and hyperparasites (pp. 473–529).

The European corn borer clean-up campaign in New York State, 1927, M. D. Leonard (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 778–783*).—This is an account of a compulsory clean-up campaign against the European corn borer, carried on in the spring of 1927 in a section including parts of three counties in western New York.

Corn-borer prefers corn to common mugwort, A. R. Marston and C. B. Dibble (*Michigan Sta. Quart. Bul., 11 (1928), No. 2, pp. 69–72, figs. 2*).—In a comparative study made of the attraction of corn and the common mugwort (*Artemisia vulgaris*), it was found that in Michigan the European corn borer prefers corn as a host plant, corn not being protected from borer attack by the presence of mugwort. While a migration of the corn borer from corn to mugwort is possible after the eggs have been deposited on the corn, the migration does not indicate a preference on the part of the corn borer for common mugwort as a host. The results differ from those obtained by Roubaud in France as previously noted (E. S. R., 58, p. 758).

An operation in practical control of codling moth in a heavily infested district (second report), T. J. Headlee (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 774–778*).—This is a contribution from the New Jersey Experiment Stations in which the author reports that the continuance (E. S. R., 57, p. 454) of the organized efforts of growers against the codling moth in the Glassboro district has resulted in a further material increase in fruit free from injury by that insect. In 1925 the growers who form this organization picked 50 per cent of their total fruit free from codling moth injury, in 1926 they picked 68.8 per cent free, and in 1927 they picked 82.1 per cent free. The timing, composition, and methods of applying insecticide materials are the dominant factors in obtaining this result, but orchard sanitation measures, such as proper disposal of used baskets, scraping rough-barked trees, and the use of burlap bands, play a minor but important part in obtaining this result.

Determination of the spring-brood emergence of oriental peach moths and codling moths by various methods, A. Peterson and G. J. Haeussler (*Jour. Agr. Research* [*U. S.*], *37 (1928), No. 7, pp. 399–417, figs. 9*).—In this account the authors report upon some of the results obtained from several methods employed in determining the spring-brood emergence of the oriental peach moth (*Laspeyresia molesta* Busck) and the codling moth. The work was conducted with a view to developing a method which would give results that closely resemble the actual emergence of spring-brood moths in the orchard. The data are presented under the headings of apparatus, methods, temperature, moisture, mortality of larvae, and emergence of moths.

There was found to be a marked difference in the temperature on the south and north sides of a fruit tree on clear days in the spring, whereas little or no difference occurs on cloudy days, indicating that sunlight is the important factor involved. The presence or absence of moisture about overwintering larvae was found to have a comparatively small influence on the emergence period of the moths, although it does influence mortality. Thus, overwintering larvae spun up in cocoons in corrugated paper kept in a dry insectary suffer a much greater mortality than similar material wetted frequently. In the various methods employed to determine emergence, the lowest mortality occurred in material confined in open screen cages located on poles or tree trunks where rain, dew, and snow could reach them.

The most satisfactory of the methods tested by the authors for determining the normal emergence of spring broods in an orchard proved to be that involving the use of eight screen cages placed on poles or tree trunks so that four of the cages were adjacent to the ground and four were 5 ft. above ground, and one cage of each group of four faced north, east, south, and west. This method subjects overwintering larvae to all of the elements, rain, snow, dew, wind, and sunshine. It takes into consideration the differences in temperature near the ground and several feet in the air, and also the decided differences in temperature which occur on sunny and shaded exposures. It permits an equal distribution of larvae in all possible situations which, so far as known, are similar to those in nature.

"For two or three seasons the beginning date and the peak-of-emergence date for both species of moths in the screen cages compare very favorably with similar dates in the orchards. The moth-emergence dates for the respective species of overwintering larvae kept in a canvas band, in covered boxes, in a screened insectary, and in a closed packing house are later or, in some instances, very much later than the normal emergence dates in an orchard or in the screen cages. The latest emergence for oriental peach moths occurred in the insectary, whereas for codling moths the latest emergence took place in a packing house."

Some macroscopic effects resulting from the fumigation of Plodia larvae with carbon disulphide in relation to revival potentialities, J. C. Hamlin and W. D. Reed (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 783–788*).—The authors report that during the latter part of October at Fresno, Calif., grown larvae of the Indian-meal moth revived from 1 to 2 weeks after fumigation with carbon disulfide at the rate of 2 lbs. per 1,000 cu. ft. During the period of inactivity between fumigation and revival the potential revivals may be detected with considerable accuracy by their retention of a nearly normal color and a fair degree of turgidity and by their not being severely shriveled. Among such individuals, however, one can not determine which or what percentage will later become fully resuscitated. Congestion of the intestinal tract is a common condition of reviving larvae and is operative in causing the subsequent death of a portion of them. Five larvae, revived from the 6-hour exposure, developed to the adult condition.

Poisons for cutworm baits, C. Lyle (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 748–750*).—A comparison made by the author in Mississippi of Paris green with sodium fluosilicate in poison baits against the black cutworm and the fall army worm indicated that Paris green is more rapid in its action and considerably more toxic, and that the black cutworm is more easily killed than the fall army worm.

The Hessian fly in California, C. M. Packard (*U. S. Dept. Agr., Tech. Bul. 81 (1928), pp. 26, figs. 2*).—This is a report of studies commenced by the author in 1910 and continued with some interruptions up to the time of writing.

In California the Hessian fly is of economic importance only in wheat-growing regions near the coast, where the influence of the ocean is sufficient to prevent extremely high summer temperatures. It injures the wheat crop to a slight extent practically every year and causes serious injury in occasional years when climatic conditions are particularly favorable to its development. It passes the summer, fall, and winter in the form of puparia in the stubble. The main emergence of adults from the stubble usually occurs in March, and a minor emergence of adults from the young wheat in late April. Heavy September rains have been known to cause most of the flies to issue from the stubble in early fall. The injury to the wheat takes place during March, April, and May and is caused by the feeding of the larvae underneath the leaf sheaths. The life stages of the Hessian fly in the State are identical with those found in the Eastern States.

It is attacked by several hymenopterous parasites which, however, do not control it. Because of the radically different climatic conditions, the artificial control methods used in the eastern part of the United States can not be applied in the State. "Burning stubble, plowing it under, and throwing it out upon the surface by cultivation in early summer to cause desiccation of the puparia, are partially effective control measures but are not universally applicable. The development of resistant varieties is only in the experimental stage but offers some possibilities. The most practical measures for control of the Hessian fly in California are practices already in common use for other reasons. These are rotation of crops, early planting, and the stimulation of rapid, vigorous growth."

The Coachella Valley (California) Hippelates fly project, W. B. Herms (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 690–693, pl. 1*).—An account of the progress of investigations (E. S. R., 56, p. 251) of this pest, conducted with a view to determining the breeding habits, its source still remaining a mystery.

The effect of different quantities of food during the larval period on the sex ratio and size of Lucilia sericata Meigen and Theobaldia incidens (Thom.), W. B. Herms (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 720–729*).—"Larvae of the green bottle fly, *L. sericata*, were removed from food in lots of 100 at 6-hour intervals after feeding 30 hours, the longest feeding period being 96 hours. The size of resulting flies became in general increasingly larger as the feeding period was increased, and the sex ratio was reversed from a large preponderance of males in the underfed to a preponderance of females in the longer feeding periods. Larvae of the mosquito, *T. incidens*, were reared in lots of 100 in distilled water to which yeast was added in quantities ranging from 0.5 to 5 gm. The resulting mosquitoes became in general increasingly larger as the quantity of yeast was increased, and the sex ratio was reversed in a manner opposite to that of the green bottle fly."

Repellents for blowflies, R. C. Roark, D. C. Parman, F. C. Bishopp, and E. W. Laake (*Indus. and Engin. Chem., 19 (1927), No. 8, pp. 942, 943*).—The results here reported, together with other observations, have led the authors to conclude that the most effective blowfly repellents are not necessarily highly odorous materials, such as essential oils, or even highly irritating materials, such as chloropicrin and other "tear gases," but are materials which can absorb, adsorb, or inhibit the formation of the volatile compounds evolved by decomposing meat which attract the flies to the meat. In addition to various copper compounds, such strong antiseptics as mercuric chloride, potassium permanganate, sodium salicylate, etc., when applied to meat render it almost entirely nonattractive to blowflies.

Tests of blowfly baits and repellents during 1926, D. C. PARMAN, E. W. LAAKE, F. C. BISHOPP, and R. C. ROARK (*U. S. Dept. Agr., Tech. Bul. 80 (1928), pp. 15, fig. 1*).—This is a report of work conducted in continuation of that previously noted (E. S. R., 49, p. 356; 54, p. 661; 55, p. 558; 57, p. 167) and that reported in the above article.

A study of the methods of exposing bait containers and of the distance over which repellents are effective led to the development of a method of studying the repellent properties of materials to blowflies which is thought to yield more accurate results than any hitherto recorded. It consists in smearing 5 cc. of material upon a 4-oz. cube of fresh beef liver placed on 1 in. of clean, dry sand in an ordinary pint Mason jar, and counting the number of flies within the jar at stated intervals of time. Comparison is made with the number of flies visiting similar jars containing untreated meat and placed 4 ft. from either side of the treated jar. Periodic observations are continued as long as flies in numbers continue to visit the untreated meat (from 2 to 4 or 5 days). The percentage ratio of flies visiting the treated jar, compared with the average number visiting the adjacent check jars, in the case of any material studied, expresses the repellent value of the material.

Pine-tar oil (now being used on an extensive scale by ranchmen), pyrethrum, and certain copper compounds are said to be the most promising blowfly repellents.

The type of container is said to affect the attractiveness of the bait to flies, a transparent container being more attractive than an opaque one.

Phyllophaga (Scarabaeidae) of the United States and Canada, Part I, R. J. SIM (*N. J. Dept. Agr. Circ. 145 (1928), pp. 60, pls. 12, figs. 6*).—In this contribution from the Japanese Beetle Laboratory, U. S. D. A. Bureau of Entomology, descriptions are given of 51 May beetles of the United States and Canada, arranged in 6 groups.

Cold hardiness in the Japanese beetle, Popillia japonica Newman, N. M. PAYNE (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 55 (1928), No. 3, pp. 163–179, figs. 4*).—This is a report of studies made of cold hardiness of the second and third instars of the Japanese beetle, with brief observations on the pupae and adults. The larvae were found to be somewhat periodic in their cold hardiness to the intensity factor of low temperature, less so than the oak borers which had previously been studied (E. S. R., 55, p. 658), and more so than the aquatic insects. Disease incidence, nutritional state, and degree of dehydration were associated with cold hardiness to the intensity factor of low temperature. Development of cold hardiness to the quantity factor of low temperature was associated with loss of cold hardiness to the intensity factor except in extremely dehydrated individuals. It was found that marked permeability changes associated with enzyme action occur at the vital temperature minimum.

Life history and control of the pale-striped and banded flea beetles, G. W. UNDERHILL (*Virginia Sta. Bul. 264 (1928), pp. 20, figs. 9*).—This is a report of studies of the pale-striped flea beetle conducted during the summers of 1924, 1925, and 1926, and of the banded flea beetle during the summers of 1925, 1926, and 1927, all being made in Hanover and Henrico Counties, just north of Richmond. The two species occur throughout Virginia, the pale-striped flea beetle having been observed most abundant and injurious in the Piedmont and valley sections, while the banded flea beetle seemed to be more common in the eastern part of the State. They are native species widely distributed throughout the United States and southern Canada.

Lists are given of the food plants of both species and technical descriptions of the several stages. The life history and habits of the pale-striped flea beetle are then considered (pp. 9-13), followed by a similar account of the banded flea beetle (pp. 13-16). The report concludes with a brief discussion of experiments with poison dusts for the control of the pest.

It was found that the pale-striped flea beetle has two distinct broods and hibernates as a larva, while the banded species has one complete and a partial second brood and winters as an adult. Both species are annual pests of several garden and farm crops, including beans, melons, beets, tomatoes, potatoes, carrots, corn, clover, and cotton. As a rule the chief damage occurs soon after the beetles emerge and while the plants are in the seedling stage.

The pale-striped species is generally the most numerous and injurious. The adults of the banded species usually emerge in March and early April, and the pale-striped in the latter part of May or in early June. Eggs are laid shallowly in the soil beneath the food plants. The first generation pale-striped adults emerge about 40 days after the eggs are laid; while the second brood, which overwinters in the larval stage, emerge as spring brood beetles about 9 months after the eggs are laid. The banded beetles require a development period of about 8 or 9 weeks for the first brood and about 8 weeks for the partial second brood, from the time an egg is laid until the adult emerges.

To control flea beetles, spraying or dusting as soon as injury is noticed should be done. Clean cultivation will keep down weeds on which they breed and greatly reduce the number of flea beetles.

Effect of ovulation upon seasonal history in the alfalfa weevil, S. J. Snow (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 752-761, figs. 6*).—It is pointed out that the larvae of the alfalfa weevil occur sparingly in the summer after the greater number have become adults, being too few to injure the third and fourth crops, upon which they occur.

A survey of the growth of a generation of female alfalfa weevils throughout the two seasons of its existence shows that the beetles emerging in the spring and summer remain immature for about four months at least, after emergence, or until late September and October of their first season. It indicates, too, that about half of them, with the exception of ditch-bank weevils, are capable of oviposition by the time winter sets in. Weevils from ditch banks and fence rows were found without eggs even into winter and early spring. On the other hand, the small number of females of the previous season which survive until August and September of their second summer is enough to account for the small number of eggs which are found at that time. These eggs, therefore, and any larvae which come from them, are retarded members of the old generation and not a partial new brood. The eggs developed and deposited by the beetles maturing in the fall are not likely to produce larvae of importance anywhere in the intermountain country, since the cool temperatures would prevent their hatching in sufficient numbers the same year.

Studies on nectar in relation to honey production, O. W. Park (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 789, 790*).—Some of the important findings obtained in extensive studies of nectar plants at the Iowa Experiment Station are that (1) as a rule nectars which are secreted abundantly have a lower sugar concentration than do those which are secreted less abundantly; (2) the great majority of the samples studied contained between 40 and 55 per cent of sugar, comparatively few running below 30 or above 60 per cent; (3) nectar from a given source varied over a considerable range in sugar concentration, one of the most important of the causal factors being the relative humidity of the atmosphere; and (4) in some species of plants the same flower continues to secrete nectar throughout a period of several days.

District Argentine ant control in citrus orchards, H. J. Ryan (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 682-690*).—The author reports upon the costs and results of two years' Argentine ant clean-up campaign in Los Angeles County, Calif.

Egg laying of Ixodiphagus caucurtei duBuysson in larval ticks, R. A. Cooley and G. M. Kohls (*Science, 67 (1928), No. 1748, p. 656*).—In experiments conducted at the Hamilton Laboratory of the Montana State Board of Entomology the junior author has found that *I. caucurtei*, a tick parasite introduced from France, will deposit eggs in fed larvae of the Rocky Mountain spotted fever tick (*Dermacentor andersoni* Stiles). Development is so delayed that the living parasite is carried through the quiescent period of the fed larva, is alive in the nymphal stage, and may remain alive through a resting period of the unfed nymphs prolonged for 50 days. Upon the nymphs being fed, the parasites will develop to maturity.

The bud mite (blister mite) of the pear, W. B. Parker (*Jour. Econ. Ent., 21 (1928), No. 5, pp. 676, 677*).—The author reports upon observations of the life history of blister mites on pear trees which differ in habits from those of the pear leaf blister mite.

ANIMAL PRODUCTION

Live stock in mythology and religion, R. A. Clemen (*Cattleman, 15 (1928), No. 1, pp. 17–24, 26, 27, figs. 8*).—An interesting article in which the author describes the origin and place of livestock, particularly cattle, hogs, and sheep, in the mythology and religion of such races as the early Egyptians, Greeks, and Romans.

Results of livestock experiments announced Livestock Day, June 1, 1928 (*Ohio Sta. Circ. 10 (1928), pp. 16, fig. 1*).—This circular contains the following articles:

Oats and barley for fattening pigs, W. L. Robison (pp. 2, 3).—In a study of the value of corn, barley, and oats (E. S. R., 60, p. 171) rations, 7 lots of pigs were fed from an approximate initial weight of 53 lbs. to an average final weight of approximately 205 lbs. All lots received a protein supplement of tankage and linseed meal 2:1, ground alfalfa, and minerals. In addition, barley, corn, oats, corn and oats, corn and hulled oats, hulled oats, and corn and sifted oats were fed in the respective lots. The grains were ground and the feeds were mixed and hand fed. The average daily gains were 1.05, 1.1, 0.83, 1.17, 1.23, 1.14, and 1.17 lbs. per head in the respective lots.

As a complete substitute for corn, a pound of barley was 90.4 per cent and a pound of oats 82.3 per cent as efficient as a pound of corn. As a partial substitute for corn, ground oats had a higher value than as a complete substitute. Hulled oats alone were 41 per cent and as a partial substitute 62 per cent more efficient than corn. The sifted oats were not as efficient as hulled oats as a partial substitute for corn either in the production or economy of gains.

Middlings, "Palmo Midds," and cocoanut meal for pigs, W. L. Robison (pp. 4, 5).—Pigs averaging 65 lbs. each were divided into 6 lots of 6 pigs each and fed a basal ration of corn, tankage, ground alfalfa, and minerals. To the basal ration was added linseed meal, flour middlings, standard middlings, Palmo Midds, coconut meal, and cacao bean meal. The average daily gains in the respective lots were 1.07, 0.99, 1.07, 1.1, 1.11, and 0.28 lbs. per head.

In this study flour middlings were worth 87.4 per cent as much as corn, and standard middlings 7 per cent less than flour middlings. The Palmo Midds had a slightly higher value than the other middlings in this test. Coconut meal produced slightly faster gains but required more feed per unit of gain than did the linseed meal fed pigs. The cacao bean meal gave very poor results, both in rate and economy of gain.

Effect of cooking soybeans for pigs, W. L. Robison (pp. 5, 6).—A basal ration of corn, ground alfalfa, and minerals was fed to 5 lots of 7 pigs each, averaging approximately 44.5 lbs. per head, until each animal had gained approximately 160 lbs. The protein supplements fed in the respective lots were ground soy beans, cooked soy beans limited to the amount of ground soy beans consumed, cooked soy beans in amounts that were cleaned up readily, soy bean oil meal, and tankage. The beans were cooked for about 2 hours and fed whole. The average daily gains in the respective lots were 0.68, 0.9, 1.27, 0.89, and 1.03 lbs. per head.

Ground soy beans were not an economical protein supplement either in the production or economy of gain. The cooked soy beans either in limited or unlimited amounts were more economical than the ground soy beans. Pigs in lots 2 and 3 were ready for market 59 and 110 days, respectively, before those in lot 1. Soy bean oil meal was found to be worth 89 per cent as much as tankage in this trial.

Value of processing roughages, G. Bohstedt, D. S. Bell, and P. Gerlaugh (pp. 7–9).—In a study of the value of processed roughages for fattening calves 1 lot of heifers and 7 lots of steers averaging approximately 443 lbs. per head were fed for 147 days. All lots received shelled corn and linseed oil meal. The heifers and the first lot of steers received in addition corn silage and alfalfa hay, lot 3 predigested chopped roughage, lot 4 steamed chopped roughage, lot 5 chopped roughage, lot 6 ground roughage, lot 7 whole roughage, and lot 8 chopped roughage and grain mixed. Corn stover and alfalfa hay equal parts formed the roughage used in lots 3 to 8. The average daily gains in the respective lots were 2.01, 2.01, 1.63, 1.76, 1.93, 1.86, 1.82, and 1.93 lbs. per head.

In this test the heifers proved more profitable than the steers, due entirely to their lower initial cost, since the amount of feed consumed, the feed required per unit of gain, and the daily gains were practically the same. There was a slight advantage in both rate of gain and return per calf in feeding chopped roughage as compared to whole roughage, but there was practically no difference in chopped and ground roughage. Mixing the grain and roughage produced no saving in feed, nor did it increase the rate of gain, but cattle so fed had a higher market value and hence returned more profit. Predigesting and steaming the roughage showed no advantages, and the additional expense and labor involved was not justified. The silage-fed lots showed silage to be preferable to dry roughage fed either whole, chopped, ground, steamed, or predigested.

Ground oats as a partial substitute for shelled corn, H. W. Rogers and P. Gerlaugh (pp. 9–11).—Previously noted from another source (E. S. R., 60, p. 169).

Maintaining a herd of breeding cows and fattening the calves, P. Gerlaugh (pp. 11–13).—This is a progress report for the winter of 1927–28.

Minerals in the winter ration for pregnant and nursing ewes, D. S. Bell (pp. 13–15).—Previously noted from another source (E. S. R., 59, p. 260).

Ram lambs in the feed lot, D. S. Bell (pp. 15, 16).—A lot of 27 ewe and wether lambs and a lot of 18 ram lambs were fed for 134 days to obtain information on the advisability of using ram lambs as fattening animals. In this, as in previous tests (E. S. R., 57, p. 170), the ram lambs made more rapid and economical gains than did the ewes and wethers. Due, however, to discrimination against ram lambs, the ewe and wether lambs sold for a higher price and returned a greater profit per head than did the ram lambs. The ewe and wether lambs had an average dressing percentage of 47.52 and the ram lambs 43.41.

A survey of livestock breeding and feeding practices in three different sections of Oklahoma, W. A. Craft (*Oklahoma Sta. Circ. 73 (1928), pp. 24, figs. 5*).—The results of a survey of 341 farms in three sections to determine the feeding and breeding practices followed in the handling of livestock are reported. Cattle were found on 95.6 per cent, hogs on 58 per cent, and sheep on 9 per cent of these farms. Of the farmers having cattle, 70 per cent produced some to sell, but purebred bulls were used by only 55.2 per cent of the farmers who had cattle. The average size of the herds headed by purebred bulls was 14 and by grade bulls 7 head of cows and heifers. Cattle by purebred bulls sold on the open market brought from 10.8 to 123.7 per cent more than those sired by grade bulls. Fattening cattle before selling was practiced by less than 10 per cent of the farmers.

Only 58 per cent of the farmers produced hogs for market. Purebred boars and sows were used by 29.2 per cent of the farmers raising hogs for market, 36.9 per cent were using purebred boars and grade sows, and 33.9 per cent were using grade boars and grade sows. The average size of the herds was 6.5, 4.6, and 3.3 sows and gilts in the respective groups. On the market, pigs sired by purebred boars brought from 13 to 39 per cent more than those sired by grade boars. Less than 25 per cent of the farmers used protein supplements in their feeding operations, and a shortage of hog pasture was found.

Sheep were found on only 9 per cent of the farms, and the average size of the flocks was 35 head. Purebred rams were used on 65 per cent of these flocks. Sheep sired by purebred rams brought 37.5 per cent more on the market than those sired by grades.

There was an average of 2.5 mares on these farms, only 17.9 per cent of which were bred. The farmers in this survey sold only 7 mares, and it was a common practice to feed the horses only when they were working.

Of the purebred sires used for all classes of livestock, many were of poor type and quality, and some were even inferior. With most of the farmers, the cost was the most important factor in determining the kind of sire to be used. Sires unrelated to the females were in demand by most farmers, but aside from the sires little attention was paid to pedigree. Practically 50 per cent of the farmers were willing to try cooperative ownership of sires, but needed help in organizing.

Composition and cost of commercial feeding stuffs in 1927, A. W. Clark et al. (*New York State Sta. Bul. 556 (1928), pp. 39*).—A summary of a general nature regarding the different classes of feeding stuffs, together with the average composition, average selling price, and the cost per pound of protein and fat, based on chemical and microscopical analyses of 2,290 samples of commercial feeding stuffs collected during the year 1927 (E. S. R., 58, p. 63).

On the speed of the growth weight of animals during different periods in relation to the size of the growing mass [trans. title], A. A. Maligonov (*Trudy Kuban. Selsk. Khoz. Inst. (Arb. Kuban. Landw. Inst.), 3 (1925), pp. 151–157*).—In this study at the Kuban Agricultural Institute, Union of Socialistic Soviet Republics, the author applied two theories of growth to male cattle from the zygote state to an age of 6.5 months. He concludes that the speed of growth must be considered as a ratio of the increase of the mass per unit of time to the size of the growing mass. The period of maximum growth was found to occur at about the time of zygote formation. After this period the rate of growth drops rapidly at first and later with an increasing retardation in time.

On the growth of the chief tissues and organs in the second half of the embryonic and postembryonic periods [trans. title], A. A. Maligonov and

G. F. RASKHODOV (*Trudy Kuban. Selsk. Khoz. Inst.* (*Arb. Kuban. Landw. Inst.*), *3* (*1925*), *pp. 159–200*).—This study of cattle in the embryonic and postembryonic state, with special reference to the speed of growth of purebred and scrub stock, indicates that in the embryonic state the scrub stock grew the more rapidly. The theories of growth, mode of embryonic nutrition, respiration, blood circulation, and sequence of organ development in various animals are discussed.

A short report on the character of the growth and structure of the skull of cattle in relation to the postulated conditions of growth [trans. title], A. A. MALIGONOV and G. F. RASKHODOV (*Trudy Kuban. Selsk. Khoz. Inst.* (*Arb. Kuban. Landw. Inst.*), *3* (*1925*), *pp. 201–223, figs. 7*).—In this report the authors give the results of a study of the rate of growth of the skull of cattle during the second half of the embryonic period and after birth. Illustrations, tables, and charts are extensively used to show the results of the work.

The character of the bone channels in connection with the energy of growth [trans. title], A. A. MALIGONOV and F. I. BEDNI͡AGIN (*Trudy Kuban. Selsk. Khoz. Inst.* (*Arb. Kuban. Landw. Inst.*), *3* (*1925*), *pp. 225–230, pl. 1*).—Results of a study of the anatomical structure of two breeds of cattle in relation to the energy of growth of bones and of their blood systems are discussed.

Data on the porosity of bones [trans. title], A. A. MALIGONOV and G. F. RASKHODOV (*Trudy Kuban. Selsk. Khoz. Inst.* (*Arb. Kuban. Landw. Inst.*), *3* (*1925*), *pp. 231–236*).—A study of the porosity of bones before and after the birth of cattle is presented with a discussion of the rôle of the bone marrow.

The specific area of the periosteum and its probable significance in the life of the bone tissue [trans. title], A. A. MALIGONOV and V. I. I͡UDIN (*Trudy Kuban. Selsk. Khoz. Inst.* (*Arb. Kuban. Landw. Inst.*), *3* (*1925*), *pp. 237–245*).—This is a discussion of how the area of the periosteum influences the growth development of various bone tissues.

The question of the maintenance ration in relation to body composition [trans. title], V. I. I͡UDIN and N. I. VEL'T (*Trudy Kuban. Selsk. Khoz. Inst.* (*Arb. Kuban. Landw. Inst.*), *3* (*1925*), *pp. 247–261*).—The results of experiments on the maintenance ration of jack rabbits are reported, together with a discussion of heat formation in relation to the anatomical composition of mammals.

On infantilism, premature sexuality, and chronic skinniness of farm animals [trans. title], A. A. MALIGONOV (*Trudy Kuban. Selsk. Khoz. Inst.* (*Arb. Kuban. Landw. Inst.*), *3* (*1925*), *pp. 297–343*).—This is a report of an anatomical study made from a physiological and nutritional standpoint in the embryonic and postembryonic state to determine conditions and factors producing infantilism, premature sexuality, and other deformities.

Cattle feeding experiments, 1927–28, P. GERLAUGH (*Ohio Sta. Bimo. Bul.*, *13* (*1928*), *No. 6, pp. 201–206*).—Continuing the study noted on page 463 for another 77 days, it was found that while there was a difference of only 25 cts. in the market value of steers and heifers in May, there was $1.19 difference in August in favor of the steers. The steers gained 0.12 lb. more per head daily than did the heifers and required considerably less feed per unit of gain. However, at the end of the test the heifers were quite a bit fatter than the steers.

Mixed hay was substituted for corn stover and alfalfa hay in lots 3, 4, and 5, lot 3 receiving predigested hay, lot 4 chopped hay, and lot 5 whole hay. There was little difference in the daily gains of the cattle in these groups. The cost of 100 lbs. of gain was highest in lot 5 and lowest in lot 4. However, the market value showed lot 5 again to be high and lot 3 low, while the profit per steer was in the same order.

Lots 6, 7, and 8 were fed shelled corn, ground shelled corn, and ground ear corn, respectively, in such amounts as they would clean up. The lots ranked in the following order: In rate of gain 6, 7, and 8, in cost of gain 7, 8, and 6, and in profit per steer 6, 8, and 7.

Roughages for fattening two-year-old steers, J. M. EVVARD, C. C. CULBERTSON, Q. W. WALLACE, and W. E. HAMMOND (*Iowa Sta. Bul. 253 (1928), pp. 385–422, figs. 7*).—A more detailed account of work previously noted (E. S. R., 57, p. 266).

Carcass comparisons of mature and immature steers, M. T. FOSTER (*Missouri Sta. Research Bul. 117 (1928), pp. 28, figs. 11*).—A more detailed account of work previously noted (E. S. R., 58, p. 461).

Factors that influence wool production with range Rambouillet sheep, D. A. SPENCER, J. I. HARDY, and M. J. BRANDON (*U. S. Dept. Agr., Tech. Bul. 85 (1928), pp. 48, figs. 15*).—The fleeces of purebred Rambouillet ewes sheared the first week of June, 1921, 1923, and 1924, were used in this study. The yearling fleeces were 12 to 14 months' growth, while from the older ewes the wool was exactly 1 year's growth. The ewes were handled in bands under typical range conditions and by practical methods as exist in Idaho. Before shearing the fleeces of the yearling ewes were scored individually for fineness, character, density, and face covering. At shearing time a 1-lb. sample of wool from the side of each fleece was taken for analysis. The yearling ewes were weighed after shearing and judged for mutton conformation, condition, back, rump, and leg and for folding of the skin. Each wool sample was weighed immediately after shearing, and this weight used for determining the weight of moisture, grease, dirt, and clean wool in the respective fleeces. The length of staple was also measured in each case.

In the study it was found that age exerted its most important influence by shortening the length of staple. The weight of unscoured fleeces was closely associated with the amount of dirt present, the heaviest fleeces having the most dirt. These fleeces also contained the most clean wool, grease, and moisture. As the weight of the clean wool fleece increased there was an increase in the weights of moisture, grease, and dirt and in length of staple and character and density of fleece, but a sharp decrease in the proportion of clean wool to moisture, grease, and dirt. The greater weights of moisture were found in the heavier fleeces, but the proportion of weights of wool, grease, and dirt to moisture decreased as the weight of moisture increased. The heaviest unscoured fleeces had the most grease, and in general these fleeces had a tendency to be shorter in staple length. The proportion of clean wool, moisture, and dirt to grease decreased rapidly as the weight of grease increased. A correlation of 0.8023± 0.0076 was obtained between weight of dirt and weight of unscoured wool per fleece, this being the highest correlation found among the factors studied. An increase in weight of dirt was accompanied by increased weights of clean wool, moisture, and grease, but there was a consistent decline in proportion of dirt to clean wool, moisture, and grease.

An increase in length of staple was associated with improved character of fleece, greater weight of scoured wool, less grease and dirt, and a little less density. The finer fleeces tended toward more density and higher character, but were lighter in weight, both scoured and unscoured. Animals free from heavy face covering tended to yield slightly heavier fleeces, both scoured and unscoured, and freedom from skin folds was correlated with greater length of staple, somewhat greater fineness of fiber, higher character, lighter unscoured fleece and clean wool weights, considerably less grease and dirt, and less density.

Yearling ewes ranging in weight from 80 to 110 lbs. after shearing produced the heaviest scoured fleece weights. The body weights of these ewes increased with greater density and fineness of fiber and slightly heavier weights of unscoured wool. As body weights increased the proportion to weights of wool and grease decreased. Mutton conformation had little effect upon the various wool factors studied. A slight relationship existed between improved type and rump and a small increase in unscoured fleece. The ewes approaching closest to ideal mutton type produced fleeces averaging slightly longer in staple.

Feed and care of the brood sow and litter, F. B. Morrison, J. M. Fargo, and G. Bohstedt (*Wisconsin Sta. Bul. 400 (1928), pp. 24, figs. 11*).—A practical publication on the care, feeding, and management of brood sows, together with information of the same kind for the litters produced. Illustrative material gives measurements and descriptions for equipment that is useful in swine production.

Swine performance record: Litter comparisons.—Series I, C. C. Culbertson, J. M. Evvard, H. H. Kildee, M. D. Helser, et al. (*Iowa Sta. Leaflet 26 (1928), pp. 14*).—In an effort to set up exact methods by which the efficiency of swine breeding stock can be measured, a plan was outlined and the work reported herein gives the first attempt to put it into practice. Four pigs from a litter of at least 7 living pigs farrowed by gilts or 8 by older sows, weighing on the average from 35 to 45 lbs. and being not over 65 days old, were to be delivered to the station. The sire and dam of the litters were required to be purebreds, although not necessarily of the same breed. The pigs were to be fed to an average final weight of 225 lbs. and 2 representative pigs slaughtered at this weight. The pigs were weighed on 3 consecutive days, the middle day being when the pigs were 65 days old, and the average taken as the initial weight. They were weighed every 30 days thereafter until they reached 225 lbs., when they were again weighed on 3 consecutive days. Certain growth measurements were taken when the pigs arrived, 60 days later, and at the end of the test.

The data presented in this preliminary work are a comparison of 10 litters which were fed, handled, and the representative pigs slaughtered in identical manner. The average daily gain of all groups was 1.4 lbs. per head. The lot reaching the final weight in the least time required 117.5 days, while the longest time required was 162.5 days. Daily feed consumption ranged from 5.79 to 4.7 lbs. per head, and the feed required to produce 100 lbs. of grain ranged from 361 to 436 lbs. Dressing percentages ranged from 80.4 to 82.46, but there were few outstanding differences in the yield of important cuts. The data, including the measurements taken, are presented in tabular form.

No conclusions are drawn from the test, which is presented primarily to show the progress of the work.

Superior supplementary blends for the balancing of corn in fall pig production, J. M. Evvard, C. C. Culbertson, W. E. Hammond, and C. F. Bassett (*Iowa Sta. Leaflet 25 (1928), pp 8*).—Studies of the value of combinations of protein feeds as supplements to corn have been continued (E. S. R., 56, p. 266). Five lots of 6 fall pigs each were fed from an average initial weight of 59 lbs., and the data were calculated to average final weights of 200, 225, 250, and 300 lbs. All lots received shelled corn and a mineral mixture self-fed. In lot 1 tankage was used as the protein supplement; in lot 2 the "Trinity" supplement; in lot 3 the modified Trinity mixture; in lot 4 the "Big Ten" supplement consisting of tankage 40 lbs., linseed meal 15, alfalfa meal 12.8, cottonseed meal 20, peanut meal 9, salt 1, limestone 1.5, iron oxide 0.198, wood ashes 0.5, and potassium iodide 0.002 lb.; and in lot 5 the modified Big Ten, in which 3 lbs. of peanut meal was replaced by a like amount of tankage and 6 lbs by linseed oil meal. These supplements were also self-fed.

The relative position of the lots as to rate of gain and number of days required to reach final weight was the same at all the weights. The rate of gain increased in every case from 200 to 300 lbs. The lots ranged as follows: 2, 5, 4, 3, and 1. The lots receiving the blended supplements consumed more feed than the lot receiving tankage alone. The amount of feed required per unit of gain was greater in lot 1 at all weights than in any of the other lots. Less corn was required to produce 100 lbs. of gain, except in lot 2 at 200 lbs., for all the rations receiving the blended supplements than in the tankage only ration. All the supplements except that in lot 3 were more efficient, pound for pound, than tankage in balancing a corn ration, and the Trinity mixture was the most consistently efficient at all weights. The gains in lots 2 to 5, inclusive, at all weights cost less than in lot 1, and this was especially true in lot 4. The supplementary blends made a better relative margin showing after 200 lbs. was attained, and from then on to 300 lbs. the superiority of the blends was further emphasized over straight tankage.

Supplement cull beans with animal protein, W. E. J. EDWARDS and G. A. BROWN (*Michigan Sta. Quart. Bul., 11* (*1928*) *No. 2, pp. 62–65*).—The study of the value of cull beans for fattening hogs has been continued (E. S. R., 59, p. 463), using 6 lots of 8 pigs each. The pigs were fed from an average initial weight of 108 lbs. to an average final weight of approximately 202 lbs. Lot 1, the check lot, received ground corn and tankage; lot 2 cull beans and ground corn 2:1, hand-fed; lot 3 cull beans and ground corn 2:1 plus tankage self-fed: lot 4 cull beans and ground barley 2:1, hand-fed; lot 5 cull beans and ground barley 2:1 plus tankage self-fed; and lot 6 cull beans and ground oats 2:1, hand-fed. All lots had access to a mineral mixture, and alfalfa hay was fed at fairly regular intervals. The cull navy beans were boiled until fairly soft and then mixed with ground grains. Lot 1 was watered in a trough, while the remaining lots were given what was considered sufficient water mixed in the feed. The average daily gains in the respective lots were 1.71, 1.1, 1.35, 1.01, 1.26, and 1.11 lbs. per head. It required 55, 84, 71, 86, 77, and 84 days for the pigs in the respective lots to reach the final weight.

While the rate of gain was highest and the feed requirement per unit of gain the lowest in lot 1, the cost of the feeds made the gains in this lot the most expensive. Adding tankage to the cull beans and corn increased the rate of gain and decreased the cost and feed requirements per unit of gain. The addition of tankage to the cull bean and barley ration also increased the rate and decreased the cost and feed requirements of the gains. The rate of gain was higher and the cost and feed requirement lower in the corn, cull bean, and tankage ration than in the ration in which barley replaced the corn. The rate of gain was practically the same whether corn, barley, or oats were fed with the beans. The feed required per unit of gain when corn was fed was practically the same as when barley was fed, but was 12 per cent higher than when oats were fed. Although cull navy beans have a high protein content, the addition of tankage to rations containing beans increased the rate and lowered the cost of gains.

On the digestibility of various feeds by working horses [trans. title], A. A. MATORIN (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *3* (*1926*), *No. 5–6, pp. 397–406, fig. 1*).—An analysis of meadow hay fed to two mares during a digestion trial and also of the feces excreted daily for a period of nine days showed that a rather large proportion of undigested nutrients passed through the digestive tract. When oats and hay were fed together the following percentages of nutrients digested were found: Crude fat 83.9, crude protein 80.13, pure protein 79.93, ash 64.84, crude fiber 66.11, and nitrogen free extract 98.48.

Some data on the problem of the chemical composition of the metacarpal bones of the native Kuban horse [trans. title], G. F. RASKHODOV (*Trudy Kuban. Selsk. Khoz. Inst.* (*Arb. Kuban. Landw. Inst.*), *3* (*1925*), *pp. 263–272*).—A chemical analysis of the metacarpal bones of these native horses showed them to be low in organic matter, fat, and carbonates, due to the fact that the animals were underfed.

Feeding experiments with poultry (*New York State Sta. Rpt. 1928, pp 24, 25*).—It has been found that hens matured outdoors can survive the ordinary winter confinement and maintain heavy egg production with good rations, but without access to sunlight can not prolong this period without losing strength followed by a general breakdown. Exposure to sunlight before complete collapse resulted in rapid invigoration and return to laying and normal hatchability of eggs. Less than a tenth of the sunlight available under favorable conditions and reflected light alone were probably sufficient to maintain good health during the year. Exposure to direct sunlight for a few hours once in two weeks has also been found to give favorable results.

Results of feeding tests indicate that not more than one-third of the ration can consist of coarse feeds, supplying about 10 per cent of the dry matter, without diminishing production.

[Experiments with poultry at the Ohio Station] (*Ohio Sta. Bimo. Bul*, *13* (*1928*), *No. 6, pp. 210–220, figs. 4*).—The results of two studies are briefly noted.

Producing hatchable eggs, R. M. Bethke and D. C. Kennard.—In summarizing this work, previously noted (E. S. R., 59, p. 263), the authors emphasize the fact that good or poor hatching of eggs depends largely upon the feeding and management of the laying hens. Especially is this true when the birds are confined and not allowed access to outdoor range. Alfalfa, clover, and soy bean hays of good quality have proved the most effective substitutes for green feed, while skim milk and buttermilk serve as partial substitutes. Cod-liver oil was the most efficient and practical equivalent of direct sunlight. Glass substitutes in certain localities may be used to advantage, but artificial ultraviolet light is not yet considered practical.

Tipping beaks for "pickouts," D. C. Kennard.—After discussing two outbreaks of vent picking and their cause, the author describes a method of tipping the beak that will prevent further trouble. This tipping has also proved successful in preventing cocks from fighting.

The gross maintenance requirement of White Leghorns, H. W. TITUS (*Poultry Sci.*, *8* (*1929*), *No. 2, pp. 80–84*).—In this article from the U. S. D. A Bureau of Animal Industry, the author describes a method of determining the gross maintenance requirement of chickens from data obtained from feeding experiments especially designed for that purpose. When no eggs were produced the following formula was used for the calculations:

$$R=m-nL,$$

in which R is the weight of the daily allowance of feed per bird, m the daily maintenance requirement, n the number of grams of feed equivalent to a loss of 1 gm. of live weight, and L the average loss in live weight per bird per day. When an appreciable number of eggs were produced, the following relationship was assumed:

$$R=m-nL+sE.$$

in which s equals the number of grams of feed required to produce an egg and E the number of eggs produced daily per hen. When only a few eggs were laid, the first formula was used and R was corrected by subtracting s grams of feed for each egg produced.

This preliminary work has shown that the gross maintenance requirement of White Leghorn hens 16 months old and averaging 1,632 gm. in weight is 64 gm. per bird per day during July on the ration fed. The amount of feed required over and above maintenance to produce an egg was estimated to be about 40 gm.

The influence of individual variation upon nitrogen metabolism studies with poultry, C. W. Ackerson, M. J. Blish, and F. E. Mussehl (*Poultry Sci.,* 5 (*1926*), *No. 1, pp. 1–10*).—The Nebraska Experiment Station, in studying the individual variations of nitrogen metabolism trials, found that 1 hen while on a nitrogen-free diet excreted 782 mg. of nitrogen daily. Twenty days later, while receiving 540 mg. of nitrogen derived from whole hull-less oats, she excreted but 724 mg. After another 20-day interval while ingesting the same amount of nitrogen, the quantity in the excreta had dropped to 706 mg. daily.

Another hen while on a nitrogen-free diet excreted but 294 mg. of nitrogen daily. Twenty days later, on feeding 540 mg. of nitrogen derived from the hull-less oats, her nitrogen excretion was found to average 915 mg. daily.

Data on 120 mature nonmolting and 68 molting Rhode Island Red hens showed that the mean of the total nitrogen excreted daily by the first group was 349±4.4 mg. and for the second group 520±10.6 mg. The difference, which is 15 times the probable error, makes these figures quite significant.

In a month-to-month study of the amount of nitrogen excreted by hens on a nitrogen-free diet, the amount was fairly constant for the first 5 months. During June, July, and August a gradual change occurred, due to the fact that the population was made up of both molting and nonmolting birds. In August the mean was that of molting birds, and these conditions did not change to any extent during the remainder of the year.

From this work it has been calculated that the average hen requires 2.2 gm. of protein daily for maintenance, except during the molting period, when 3.25 gm. daily are required. However, this requirement assumes that all of the protein is used, which is not according to known facts, and it does not take into account the fact that the biological value of protein decreases as the level of nitrogen intake increases.

The variation in the weight and number of eggs and the weight of White Leghorn fowls during the first two years of production, H. Atwood (*Poultry Sci.,* 8 (*1928*), *No. 1, pp. 51–55, fig. 1*).—The West Virginia Experiment Station reports the results of an experiment designed to obtain information as to seasonal and yearly variations in production and changes in weights of eggs and birds. The 178 pullets which remained at the end of the second year had been weighed 4,272 times, and the egg weights were based on 54,483 weighings.

There was a decrease of 20.1 per cent in the number of eggs laid the second year as compared with those laid the first year. During the pullet year the minimum rate of production was in November and the maximum in May, while during the yearling year the minimum was in December and the maximum in April. The average weight of the eggs during the pullet year increased from a minimum of 39.4 gm. in November to a maximum of 57.3 gm. the following October, an increase of 45.4 per cent. The numerical average weight of the eggs for the pullet year was 53 gm. and for the yearling year 56.9 gm. During the latter year the lightest eggs were laid in July and the heaviest in December. The average production per bird for the pullet year was 9,029 gm. of eggs and for the yearling year 7,726 gm., a decrease of 14.4 per cent. There was a tendency during the pullet year for the birds to become heavier with increasing age, and the average weight per bird during the yearling year was 15.3 per cent greater than the average during the pullet year.

Factors influencing thickness of eggshell, L. W. Taylor and J. H. Martin (*Poultry Sci., 8 (1928), No. 1, pp. 39–44*).—In this study at the Kentucky Experiment Station the shells and membranes of eggs produced by hens fed identical rations but kept under varying conditions were washed and dried at 100° C. for 20 hours. The eggs were saved for breaking after 3.5, 4.5, 5.5, and 6.5 months of experimental conditions, which had started November 1.

The average percentage of shell for each of the above periods showed a steady decline whether the hens were confined and received sunlight through window glass, were confined and irradiated for 30 minutes daily at 5 ft. with a quartz mercury arc lamp, or were allowed free range on bluegrass pasture. The last lot had the heaviest shells at all times, and the first lot the lightest shells. It was evident that an insufficient supply of vitamin D produced a gradual thinning of egg shells.

The average percentage of shells from 84 Barred Rocks was 8.66 ± 0.0603 and from 97 White Leghorns 9.13 ± 0.0453. The difference is 6.2 times the probable error, showing that the Barred Rocks of this strain laid eggs with a significantly lower percentage of shell. On the basis of pedigrees the White Leghorns were divided into groups, and it was found that 14 daughters of 1 sire had as a mean percentage of shell 8.77 ± 0.1163 and 11 daughters of another sire 9.4 ± 0.1186. This difference is significant, indicating that hereditary factors influence the percentage of shell. No significant differences between eggs of different shapes and sizes and percentage of shell were found, and the weight of eggs per dozen showed no relation to thickness of shell.

Rickets in chicks.—III, The effectiveness of mid-summer sunshine and irradiation from a quartz mercury vapor arc in preventing rickets in chicks, G. F. Heuser and L. C. Norris (*Poultry Sci., 8 (1929), No. 2, pp. 89–98, figs. 2*).—Continuing this series of studies at the New York Cornell Experiment Station (E. S. R., 56, p. 869), 48-hour-old White Leghorn chicks were divided into 14 lots of 34 chicks each. A basal ration known to prevent rickets when supplemented with cod-liver oil was fed for 8 weeks. Three checks lots were used, 1 of which received the basal ration only and was confined indoors at all times. The second received the same ration, but was allowed free access to an outdoor run so constructed that they received no direct sunlight, while the third control had 0.5 per cent of cod-liver oil added to the ration. A group of 5 lots was exposed for an average of 18.2, 13.7, 9.1, 4.6, and 2.3 minutes daily, respectively, to the rays of a quartz mercury vapor arc at 36 in. Of the remaining lots 1 had unlimited access to sunlight, and the other lots were exposed for an average of 79.7, 41.4, 31.5, 21.3, and 10.9 minutes daily, respectively, to direct sunlight. At the end of the eighth week, 3 average cockerels from each lot, excepting the one receiving cod-liver oil, were selected for bone analysis.

It was found that an average exposure of 10.9 minutes daily to sunlight was sufficient to produce normal growth and to prevent the development of rickets. Irradiation for 9.1 minutes daily with the quartz mercury vapor arc was sufficient for normal growth, but some indications of rickets developed in this lot and 13.7 minutes' daily irradiation was necessary for complete protection. In the 2 check lots not receiving cod-liver oil, there was 100 per cent rickets at 8 weeks. In this test there was little, if any, difference in the effectiveness upon chicks of irradiating with a quartz mercury vapor arc and exposing to strong midsummer sunshine. There were no indications of any differences from exposure to sunlight and to the quartz mercury vapor arc, but repeated tests indicated that chicks exposed to sunlight had greater vigor and smoother plumage.

Disinfectants retard bacteria in incubators, J. L. Boyd (*Michigan Sta. Quart. Bul., 11 (1928), No. 2, pp. 79–83*).—In determining the relative number of bacteria present in disinfected incubators, 4 sections of an incubator were washed with warm water and washing powder and disinfected with commercial disinfectants in solutions of the strength recommended by the makers. The eggs placed in these sections were sprayed with the disinfectant used in that section (E. S. R., 59, p. 570.) A fifth section used as a check was washed but not disinfected, while a sixth section, another check, was left uncleaned from the previous hatch. The disinfecting solutions used in the first 4 lots were sterilac, sodium hypochlorite, iodine suspensoid, and chlorinated lime. Agar plates were exposed in each compartment for ½, 1, and 10 minutes each the second day of incubation, 10 and 20 minutes each on the eleventh day, and 10, 20, and 30 minutes each on the twentieth and twenty-first days.

When section 6 is taken as having 100 per cent of bacterial contamination, the relative percentage bacterial count in lot 5 was 30.2, lot 4 85.5, lot 3 4.8, lot 2 3.5, and lot 1 9.1. The figure for lot 4 is misleading since the turning apparatus in this section broke several eggs on the fifteenth day, and the egg material furnished a desirable medium for bacterial growth. The figures show that thorough cleaning of the incubators was the greatest factor in reducing bacterial count, while the use of disinfectants still further reduced the counts. The bacterial infection on the agar plates increased as the period of incubation progressed, and the greatest count was at hatching time, caused probably by the movement of the chicks. While cleaning and disinfecting practically sterilized the incubator, the air passing through the ventilators tended to increase the bacterial infection as incubation progressed. The eggs used were from blood-tested breeding stock, and no pathogenic bacteria were found on the plates. However, the test indicates the value of cleaning and disinfecting to lessen the danger of incubator-transmitted diseases.

Pheasants: Their natural history and practical management, W. B. TEGETMEIER, edited by E. PARKER (*London: Field Press, [1922], 6. ed., rev., pp. XV+268, pls. 20, figs. 17*).—An interesting and instructive treatise divided into the following sections: Natural history of the pheasant; management in preserves; management in confinement; diseases of pheasants, by H. H. Smith; pheasants adapted to the covert; and pheasants adapted to the aviary.

Turkey production and marketing, L. E. CLINE (*Nev. Agr. Col. Ext. Bul. 61 (1928), pp. 105, figs. 10*).—A popular publication dealing with the selection, breeding, feeding, management, and marketing of turkeys. Appended is a section discussing the cause and prevention of common diseases of turkeys by L. R. Vawter and E. Records.

DAIRY FARMING—DAIRYING

Feeding dairy cattle in Arizona, W. S. CUNNINGHAM (*Arizona Sta. Bul. 127 (1928), pp. 275–298, fig. 1*).—The experimental work reported in this bulletin is divided into 7 sections, the first 3 of which have been previously noted (E. S. R., 39, p. 783; 41, p. 371; 44, p. 573).

A comparison of green alfalfa and alfalfa hay for milk production is reported in part 4. A lot of 4 cows was fed by the reversal method for 4 periods of 14 days each. Green alfalfa was fed during the first and fourth periods and alfalfa hay during the second and third periods. The animals consumed approximately the same amount of feed during all the periods. The cows produced an average of 21.4 lbs. of milk per head daily when fed alfalfa hay and 21 lbs. when fed green alfalfa.

In part 5 a comparison is made of alfalfa molasses meal and alfalfa hay. Two groups of 3 cows each were fed by the reversal method through 2 periods of 28 days each, with a 7-day transition period. During the first period, group

1 received alfalfa hay and group 2 alfalfa molasses meal, and during the second period these feeds were reversed. In addition to the alfalfa, both groups were fed corn silage and a grain mixture. That the alfalfa molasses meal was more palatable than the hay was shown by the fact that all the meal was cleaned up at feeding time, while a quantity of stems and grasses remained after feeding the hay. While receiving the meal the cows produced an average of 24.5 lbs. of milk per head daily, and while receiving hay an average of 22.8 lbs. of milk. The butterfat production was the same with both rations. Body weight was maintained better on the meal than on the hay.

The results of a comparison of ground hegari and rolled barley using 2 lots of 5 cows each are reported in part 6. The test was divided into 4 periods of 14 days each, with 7-day transition periods. Lot 1 during the first period received a grain ration consisting of ground hegari and wheat bran 2:1, while lot 2 received rolled barley and wheat bran in the same proportion. At the end of each period these feeds were reversed. Hay and silage were fed in practically equal amounts to both lots. When fed ground hegari, the cows produced 7,931 lbs. of milk and 318 lbs. of butterfat, while they produced 7.865 lbs. of milk and 320 lbs. of butterfat when fed rolled barley. The small differences are considered insignificant, and as the amount of feed consumed was practically the same the ground hegari and rolled barley were considered equal in feeding value.

Part 7 gives the results of a comparison of ground yellow corn and rolled barley. Two groups of 6 cows each were fed through 2 periods of 28 days each, with a 7-day interval for changing feeds. The method of feeding was similar to that used in the above test. It was found that when lot 1 was changed from corn to barley there was a decrease of 17.3 per cent in milk production and when lot 2 was changed from barley to corn a 14.8 per cent decrease in production occurred. Lot 1 produced 6.7 per cent less butterfat on barley than on corn, and lot 2 produced 19.2 per cent less butterfat when fed corn instead of barley. The combined production while receiving corn was 9,084 lbs. of milk and 307 lbs. of butterfat, and while on the barley ration 8,966 lbs. of milk and 330 lbs. of butterfat were produced. The cows gained more weight while receiving corn than when fed barley. The test indicates that the feeding values of ground yellow corn and rolled barley are approximately equal for dairy cows.

[Experiments with dairy cattle at the Ohio Station], W. E. Krauss (*Ohio Sta. Bimo. Bul., 13 (1928), No. 6, pp. 195-201, figs. 2*).—The results of two studies are noted.

The effect of the cow's ration on the food value of milk.—The author discusses the effect of the various nutrients of feeds upon the food value of the milk.

The effect of the cow's ration on the vitamin A and vitamin B content of milk.—In an effort to determine the effect of high and low protein rations (E. S. R., 59, p. 267) upon the vitamin A content of the milk produced, groups of rats were fed a ration deficient in vitamin A until they began to lose weight. Varying quantities of milk from cows receiving rations with nutritive ratios of 1:2, 1:6.2 (normal), and 1:13, respectively, were then fed to different lots of rats (except a control lot), and the effect on their physical condition and rate of growth was noted. It was found that while 2 cc. of milk caused growth to be resumed in any case, 8 cc. was necessary for restoring good growth. The lot receiving 8 cc. of milk from the high protein ration showed a slight advantage in rate of growth, general appearance, and condition of eyes, but the difference was almost negligible.

A similar test as to the vitamin B content indicated that it required 15 cc. of milk from the normal ration, 16 cc. from the high protein ration, and 18 cc.

from the low protein ration to permit good uninterrupted growth over an 8-weeks' period.

The differences in vitamin content due to the ration were of no practical significance, indicating that cows can tolerate extreme levels of protein feeding without affecting to any extent the vitamin A and B content of the milk.

Legume hays for milk production, J. R. Dawson (*U. S. Dept. Agr. Farmers' Bul. 1573 (1928), pp. [2]+6, figs. 5*).—The author points out the superiority of legume hays over nonlegume hays in palatability, quality and quantity of proteins, mineral matter, and yield of nutrients per acre. For dairy cattle alfalfa hay has proved to be the best of the legumes, due to its high protein and calcium content, its palatability, and its greater yield per acre. It is closely followed by clovers, soy beans, and cowpeas in value for dairy cows.

Selecting dairy cows: Appearance less important than performance G. Q. Bateman (*Utah Sta. Circ. 75 (1928), pp. 8, fig. 1*).—The cost of feeding and the returns for three aged grade cows handled in exactly the same manner are recorded in this publication. The work points out the advantage of maintaining cows that are economical producers.

Data on the histological structure of the milk glands of Siberian cattle [trans. title], V. A. Tsingovatov (Tzingovatov) (*Izv. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. [Leningrad]), 5 (1927), No. 2-3, pp. 119-122*).—A histological examination of the milk glands of 40 Siberian cows in a state of rest showed that the secretory network of these glands was too small for good milk production. The unfavorable conditions under which the animals are reared is thought to be the cause of the poor development. The study shows that the number of alveoli per unit area of milk gland and their dimensions are inversely proportional. When entering upon an active production period after a state of rest the glands showed a great increase in size. During the first lactation period the secretory cells of the milk glands showed great activity.

A comparison of the milk glands of Siberian and Ukrainian cattle indicated that the former have greater potential resources for milk production. The conformation of the Siberian cows is characteristic of the best type of dairy cattle.

A new method for the practical sterilisation of milk bottles, I. N. Sutherland (*Med. Officer, 38 (1927), No. 26, pp. 281-283, figs. 2*).—In this article from the Edinburgh University, Scotland, the author describes a new method for sterilizing milk bottles, the use of which gives the producer the following advantages: (1) Small initial outlay and lessened working expenses, (2) saving of time and space, and (3) increased efficiency. The apparatus consists of a saddle-shaped boiler heated by a high-pressure lamp, a cylindrical steam-proof canvas container that can be raised and lowered, and a wooden stand for holding the bottles.

[Investigations in dairying at the New York State Station] (*New York State Sta. Rpt. 1928, pp. 31, 32, 41-43*).—Three studies are noted.

Studies of bacteria that survive pasteurization.—In continuing the study of organisms that survive pasteurization (E. S. R., 59, p. 269), it was found that heat-resisting types of bacteria are largely responsible for the "pin-point" colonies found on agar plates poured from pasteurized milk. Of the types of organisms isolated from these colonies the spore-forming and heat-resistant streptococcus types were the most important. The work has shown that faulty operation rather than insanitary practices in pasteurization plants is largely responsible for these troubles, although the organisms are frequently found in the raw milk.

Dairy products.—In these studies it has been found that the conditions of testing gelatin should approximate those which exist in ice cream if the measurements of gel strength are expected to give values that are comparable. Variations in viscosity and whipping properties of ice cream have been found to be slightly associated with variations in the mineral content of milk. An excess of sodium salts caused mixes to have a low viscosity and to whip readily, while excessive calcium salts produced opposite effects. The excessive viscosity and occasional curdling of ice cream mixes which sometimes occur when cocoa or chocolate is homogenized in the mix could be prevented by the addition of baking soda prior to pasteurization. The chocolate flavor of ice cream was improved by the addition of vanilla extract, with or without a small amount of malted milk, malt sugar, coffee, or caramel.

Market milk investigations.—This work has shown that the milk of Holstein and Jersey cows form cream layers directly proportional to the fat content of the milk. Milk cooled rapidly at cold temperatures had a decreased creaming power on second creaming, but when cooled to 60° F. or slowly to 40° the powers were normal or increased. Proper pasteurization had no injurious effect upon cream formation, but the standardization of milk may introduce variations in depth of cream layer, and especially was this true when aged Holstein skim milk was used to standardize.

Several years' work has shown that strainer cloths or cotton pads can remove most of the sediment from 80 to 100 qts. of milk before becoming clogged with sediment or milk fat, the latter usually being the cause of clogged strainers.

The chemistry of sour milk, L. L. Van Slyke (*New York State Sta. Tech. Bul. 140 (1928), pp. 14*).—A review of the work by the division of chemistry on various problems dealing with the souring of milk. The early studies were conducted to obtain information as to the factors involved in the manufacture, ripening, and digestibility of cottage cheese, while later work dealt with chemical changes in certain constituents at various stages of souring and with the determination of free lactic acid in sour milk.

A summary of research studies relating to casein and some of the applications, L. L. Van Slyke (*New York State Sta. Tech. Bul. 139 (1928), pp. 41*).—A review of the work by the division of chemistry from 1901 to 1918 on the chemistry of milk. Particular attention has been paid in these studies to the chemistry of the casein of cow's milk, and some of the practical applications of these studies as related to the cheese industry are included.

A study of gelatins and their effect on ice cream, P. S. Lucas and E. C. Scott (*Michigan Sta. Tech. Bul. 94 (1928), pp. 24, figs. 3*).—In an effort to measure and compare the effects of different grades of gelatin upon ice cream, 17 lots of 0.12 lb. of gelatin each were added to ice cream mixes of the same composition and which had all been processed in the same manner. The gelatin was dissolved in water and made up to 1.5 lbs., and this added to 22.5 lbs. of the mix in each case. Each batch was then aged for 42 hours at 35° F., frozen, and drawn from the freezer at approximately 80 per cent overrun. Before freezing samples were taken for viscosity determination, and after freezing a quart brick that was held at 0° for 3 days was placed on a wire screen for a melting test. All the gelatins used were tested for viscosity, jelly strength, acidity, and the presence of liquefying and gas-producing organisms and other bacteria.

There was a considerable variation in the time and manner of melting of the bricks containing the varying grades of gelatin. There was also a wide variation in mix viscosity. Determining the mix viscosity and gelatin viscosity with the Bloom pipette did not give a reliable index of the value of the gelatin as a binder. The Hall gelometer for measuring jelly strength gave a fair measure of the value of gelatin. The Bloom gelometer for measuring jelly strength gave very accurate measures of the value of gelatin for preventing melting in ice cream. The cost of this apparatus and the necessary facilities needed for its use do not make it practical for the manufacturer of ice cream, but the authors recommend that gelatin be purchased and used in amounts in accordance with its jelly strength as determined by this method.

VETERINARY MEDICINE

[Reports of operations of the veterinary sanitary service of Paris and the Department of the Seine, 1924–1927], H. Martel (*Serv. Vét. Sanit. Paris et Dépt. Seine, Raps. Opér. 1924, pp. 135; 1925, pp. 136; 1926, pp. 127; 1927, pp. 152*).—These are the usual reports with detailed statistical data (E. S. R., 51, p 781).

Technical research [in veterinary medicine], J. Walker (*Kenya Colony Dept. Agr. Ann. Rpt. 1927, pp. 103–202*).—The details of investigations conducted with rinderpest; East Coast fever; lung disease of lambs and sheep; diseases of the goat, including infectious pleuropneumonia: East African swine fever; avian diphtheria; poisoning by Acokanthera; anthrax; black quarter; and contagious abortion and sterility are reported upon at some length.

Report of the acting chief veterinary officer, H. Brassey-Edwards (*Kenya Colony Dept. Agr. Ann. Rpt. 1927, pp. 48–91*).—This report deals particularly with the work against rinderpest, East Coast fever, contagious bovine pleuropneumonia, bovine infectious abortion, sterility in cattle, trypanosomiasis, anthrax, black quarter, hog cholera, and several diseases of equines.

Report of the work performed by the officer in charge of the camel specialist's office, Sohawa, for the year 1926–27, C. K. Singh (*Punjab Dept. Agr., Vet. Bul. 18 [1928], pp. 29*).—In the further treatment of surra (E. S. R., 58, p. 280), potassium antimony tartrate gave better results than sodium antimony tartrate. Reports are included upon the treatment of surra in equines; treatment of surra by the use of Bayer 205 alone and combined with tartar emetic; surra transmission experiments by milk (all of which were negative); surra transmission experiments with ticks and flies; incidence of surra in privately owned animals; treatment of mange in camels; and fly survey of the Punjab.

Livestock diseases report, No. 3, M. Henry (*N. S. Wales Dept. Agr., Sci. Bul. 30 (1928), pp. 31*).—This is a report (E. S. R., 57, p. 181), of control work conducted during the year ended June 30, 1927, presented in large part in tabular form

Contribution to the study of Astragalus unifultus l'Heritier (Garbancillo) [trans. title], M. Awschalom (*Univ. Nac. Tucumán, Pubs. Lab Quím. Analit., No. 1, (1928), pp. 20, figs. 2*).—In a chemical study of *A. unifultus*, saponins glucosidal in nature and yellowish in color were extracted by the method of Kobert.

Pernicious anaemia, leucaemia, and aplastic anaemia, J. P. McGowan (*London: H. K. Lewis & Co., 1926, pp. VII+116, figs. 12*).—This report of an investigation from the comparative pathology and embryological point of view deals with the subject under the headings of leucosis of the fowl, its nature; development of the red blood cells; the occurrence of amitosis in blood formation; the further significance of amitosis in the blood tissues in health and disease; the megacaryocyte and its probable function; pathological changes in leucotic fowls; comparison of leucosis of fowls with pernicious anemia and leukemia in human beings; hemosiderosis and adiposity in leucosis of the fowl and in pernicious anemia and leukemia in human beings; and aplastic anemias.

The appendixes deal with plasma cells, paralytic phenomena in fowls with leucosis, and megacaryocytes.

A further contribution to the subject of aplastic anaemia, J. P. McGowan (*Roy. Soc. Med.* [*London*]. *Proc.*, *21* (*1928*). *No 9*, *pp. 1581–1590*, *pl. 1*, *figs. 11*).—In the author's description of the condition of benign aplastic anemia in pigs, attention is directed, among other things, to changes in the bone marrow which seem of fundamental importance in understanding normal erythrogenesis.

Borna disease and enzootic encephalo-myelitis of sheep and cattle, S. Nicolau and I. A. Galloway ([*Gt. Brit.*] *Med. Research Council, Spec. Rpt. Ser. No. 121* (*1928*), *pp. 90*, *pls. 23*, *figs. 3*).—This is a report of the results of investigations conducted by the authors at the National Institute of Medical Research. The account is presented under the headings of historical and general; properties of the virus; transmission of equine strain to rabbit and from rabbit to sheep and vice versa; experimental disease in the rabbit; authors' experiments on the transmission of the disease to monkeys, and symptoms occurring in these animals; pathogenicity of the virus of enzootic encephalomyelitis for the guinea pig, rat, mouse, and fowl; animals which have been found to be resistant to infection with the virus of enzootic encephalomyelitis; distribution of the virus of Borna disease in the animal body; elimination of the virus from the animal organism; histopathology of Borna disease; immunity; and chemotherapy.

A review of the literature on spontaneous encephalomyelitis has led to the conclusion that the enzootic encephalomyelitis of horses and cattle and of sheep is the same disease. The symptomatology and the lesions found in the central nervous system are analogous, and the intranuclear corpuscles of Joest and Degen (E. S. R., 23, p. 187) occur in the large ganglion cells of the Ammon's horn in all three species suffering from the disease in question. From cases of all three diseases a virus has been recovered and shown to be responsible for the disease. From the observations of W. Ernst and H. Hahn[1] it would seem not improbable that, if the animals had not in addition to malignant catarrhal fever a concomitant infection with Borna disease, some of the cases described as malignant catarrhal fever of cattle were encephalomyelitis. Deer appear to suffer from a similar disease spontaneously. The transmission of the disease under natural conditions is probably by the respiratory tract or by ingestion.

It was found that a solid immunity can occasionally be obtained against Borna disease in the rabbit by injecting suitably attenuated virus into the brain. Multiple intravenous injections, infection by corneal scarification, or intratesticular inoculation with fresh virus can also produce immunity. The authors did not succeed in producing immunity by inoculating virus killed by chloroform, ether, or ultra-violet light intracerebrally into rabbits. Multiple inoculations subcutaneously of large quantities of formolized virus were found to lead to immunity in a limited number of animals. Rabbits immunized against an equine strain of the virus of Borna disease were resistant to intracerebral infection with an ovine strain and vice versa.

"No cross immunity was obtained between Borna disease and herpes or rabies. Cross immunity between Borna disease and poliomyelitis was not observed when rabbits were the subject of experiment, but in an experiment carried out on a monkey the result suggested that some resistance to the virus of poliomyelitis may be produced by a previous attack of experimental Borna disease."

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[1] München. Tierärztl. Wchnschr., 78 (1927), No. 6, pp. 85–89.

In chemotherapy work urotropine (hexamethylenetetramine), the most promising drug, was tested. The dose given to the rabbit was equivalent, weight for weight, to 100 to 200 gm. for the horse and to a total amount of 600 gm., yet the authors were not able to demonstrate any prophylactic or curative action.

A list is given of 96 references to the literature.

A single-injection method of immunization against rinderpest, E. A. Rodier (*Philippine Jour. Sci., 36 (1928), No. 4, pp. 397–407*).—Tests made by the author for the Philippine Bureau of Agriculture of a vaccine prepared according to the method described in detail by Kelser (E. S. R., 60, p. 270), are said to have fully established the value of the vaccine. It is pointed out, however, that control work in the Philippines will be facilitated if the number of injections of vaccine can be reduced.

The possibility of such reduction is indicated by early tests of the vaccine prepared by the method of Kelser and by further and more extensive tests by the author, who finds " that for ordinary purposes with cattle under field conditions, a single injection of chloroform-treated vaccine prepared with spleen, lymph glands, and liver will undoubtedly protect against natural infection. However, as carabaos are highly susceptible to rinderpest, if the preparation of the vaccine is limited to the use of spleen, lymph glands, and tonsils the objections arising from the use of a dose too large to be practical for field use can be overcome by eliminating the less potent liver when preparing a vaccine for use on carabaos. Several tests, in which 20 of the cattle and 27 of the carabaos were inoculated with virulent virus, definitely show that a satisfactory immunization can be produced against a heavy artificial infection with a single dose of a vaccine prepared from spleen, lymph glands, and tonsils. A dosage of 20 cc. for carabaos and 10 cc. for cattle is in every way entirely satisfactory for field use."

It is pointed out that further investigational work is necessary in order to determine the length of the immunity conferred by the single-injection method as compared with the three-injection method, and that such work is under way.

Sweet clover disease, A. A. Hansen (*North Amer. Vet., 9 (1928), No. 12, pp. 49–51, fig. 1*).—This contribution from the Indiana Experiment Station refers to a 50-day feeding test with sweet clover. At the end of the 50 days blood taken from the jugular vein of a horse fed exclusively on sweet clover hay failed to clot.

The increased susceptibility of the albino rat infected with the tubercle bacillus to tuberculin, M. I. Smith (*Pub. Health Rpts. [U. S.], 43 (1928), No. 43, pp. 2817–2828, fig. 1*).—The investigation conducted by the author here reported is said to leave no room for doubt that the invasion of the tissues of the rat by the tubercle bacillus effects an increased susceptibility of the host, as in the case of the more susceptible animals, to certain products derived from the bacillus. "The normal rat manifests an enormous resistance to tuberculin, withstanding a dose of tuberculo-protein the equivalent of over 40 cc. of standard tuberculin per kilogram. The tubercle bacillus infected rat generally succumbs to a dose the equivalent of approximately 10 cc. standard tuberculin per kilogram of body weight. Reducing the intake of vitamin A to a minimum level which is just compatible with life decreases the resistance of the normal rat to tuberculo-protein but slightly, whereas the susceptibility of the tubercle bacillus infected rat under these conditions is so greatly increased that it generally succumbs to the equivalent of as little as 1 cc. of standard tuberculin per kilogram of body weight."

Bovine tuberculosis, C. M. Haring and J. Traum (*Calif. Agr. Col. Ext. Circ. 21 (1928), pp. 27*).—A practical summary of information on this disease in cattle.

A case of undulant fever: Treatment with Burnet's melitin [trans. title], X. Cazalas (*Paris Méd., 18 (1928), No. 34, pp. 161–166, fig. 1; abs. in Jour. Amer. Med. Assoc., 91 (1928), No. 22, p. 1754*).—The author reports upon a case of undulant fever (Bruce) at Taza, Morocco, which for eight months resisted all the commonly used forms of treatment. The diagnosis was based on a positive agglutination test at 1 to 400, a positive hemoculture (after an incubation of 26 days), and a positive intradermal test. The patient was cured in a few days by intradermal and intramuscular injections of the filtrate from a 15-day old bouillon culture of *Brucella melitensis*, known as Burnet's melitin, followed by subcutaneous injections of antimelitococcic vaccine.

The occurrence of undulant fever (Bang) in man [trans. title], J. van der Hoeden (*Tijdschr. Diergeneesk., 55 (1928), No. 21, pp. 1065–1082; Ger., Eng., Fr. abs., pp. 1079–1081*).—An account of this affection in the Netherlands, where 17 cases of undulant fever (Bang) have been detected in the Central Laboratory since 1927.

A case of Bacillus abortus infection, W. G. Parker (*Jour. Amer. Med. Assoc., 91 (1928), No. 17, p. 1289*).—An account of a case of undulant fever (Bang) in Illinois in a farmer 29 years of age who drank milk from a cow that had aborted about two months previously.

Studies in bovine lymphangitis, V. Krishnamurti Ayyar (*Indian Vet. Jour., 5 (1928), No. 2, pp. 157–178, pls. 8*).—This report of studies of bovine lymphangitis has been noted from another source (E. S. R., 59, p. 174).

Anaplasmosis following dehorning, W. H. Hilts (*Cornell Vet., 18 (1928), No. 4, pp. 330–332*).—The author reports upon an outbreak of anaplasmosis in cattle in Nevada, in which transmission appears to have taken place through the dehorning clippers. The disease appeared exclusively among animals that were dehorned in December, although only about one-third of the herd were dehorned at one time.

Hexachlorethane for the treatment of distomatosis in the ox [trans. title], L. de Blieck and E. A. R. F. Baudet (*Tijdschr. Diergeneesk., 55 (1928), No. 9, pp. 429–435; Ger., Eng., Fr. abs., p. 435*).—Satisfactory results were obtained from the use of hexachlorethane for the treatment of fluke in cattle, the dose per capsule being 10 gm. for 25 kg. body weight, given at intervals over a period of 4 days.

Euphorbia drummondii, "milk weed," a plant poisonous to sheep, H. R. Seddon (*Jour. Council Sci. and Indus. Research [Aust.], 1 (1928), No. 5, pp. 268–273*).—The author discusses suspected cases of poisoning of stock and tests at the Veterinary Research Station at Glenfield. There is said to be strong evidence that under certain circumstances sheep may die from the effects of *E. drummondii*, which at times gives off hydrocyanic acid in such quantities that even as little as 2 or 3 lbs. of the plant may contain a lethal dose.

Milk weed (Euphorbia drummondii) proved poisonous to sheep, H. R. Seddon (*Agr. Gaz. N. S. Wales, 39 (1928), No. 10, pp. 777–782*).—Noted above

Coccidiosis of sheep [trans. title], H. Carré (*Rec. Méd. Vét., 104 (1928), No. 9, pp. 530–539*).—This is a summary of information presented under the headings of symptoms, lesions, microscopical investigations, and prophylaxis and treatment.

Observations on artificial infestation of sheep with Fasciola hepatica and on a phase in the development of the parasite, R. F. Montgomerie (*Jour. Helminthol., 6 (1928), No. 3, pp. 167–174*).—The author records the successful artificial infestation of 32 sheep with *F. hepatica*. The collection and identification of the cercarial cysts and their administration to the sheep is described in detail. Following the administration of 2,550 cercarial cysts to 32 sheep, 954 liver flukes were recovered on post-mortem examination, and 37.4 per cent of the cysts developed. The smallest infestation produced was 8 per cent and the heaviest 76 per cent. Ova of the liver fluke were first found, in numbers sufficiently large to estimate, in the feces of experimental sheep in 3 cases 10 weeks after infestation, in 16 cases 11 weeks after infestation, in 2 cases 12 weeks after infestation, in 3 cases 13 weeks after infestation, and in 4 cases 14 weeks after infestation. Eggs were only detected in the feces of 2 sheep at their final, twelfth week, examination.

Contagious pleuropneumonia of the goat in Greece [trans. title], C. Mélanidi and M. Stylianopoulo (*Rev. Gén. Méd. Vét., 37* (*1928*), *No. 441, pp. 490–493*).—The authors conclude that the contagious pneumonia of goats in Anatolia described by M. Nicolle and Réfik is identical with the epizootic pleuropneumonia of the goat occurring in Greece, and that the latter does not differ from the contagious pleuropneumonia of goats reported by Leclainche and the " Bou-frida " described by Thomas in Algeria.

The susceptibility of suckling pigs to hog cholera, E. M. Pickens, R. C. Reed, M. F. Welsh, and L. J. Poelma (*Cornell Vet., 18* (*1928*), *No. 4, pp. 305–321*).—A review of the literature on the subject and the work here reported are considered to warrant the following deductions:

" Many suckling pigs from the ages of 1 to 56 days which [are] born of, and suckled by, immune mothers and kept under usual farm conditions, but not in garbage feeding or serum plants, withstand exposure to 1 cc. of hog cholera virus. Other pigs similar to the kind described [above] fail to withstand exposure to 1 cc. of hog cholera virus. Since this immunity is not sufficient to protect in certain cases, it becomes unsafe to depend upon it in herds that have been exposed to cholera. Likewise, this temporary immunity is not made comparatively permanent in all cases by inoculation with simple unmitigated virus if given during this early period. Such a procedure, therefore, becomes unsafe to depend upon.

"At times pigs when born dead, when they die in a few days, or when killed by injury shortly after birth, may show lesions which closely resemble those produced by hog cholera. Material from pigs of the kind described . . ., when injected into susceptible hogs, failed to produce the disease in the susceptible animals."

The erythrocyte count in sexually normal and abnormal fowls, A. C. Chaudhuri (*Roy. Phys. Soc.* [*Edinb.*], *Proc., 21* (*1926–27*), *No. 3, pp. 109–113*).—The author finds that the number of erythrocytes in a unit volume of blood is significantly higher in the sexually normal adult male than in the normal adult female of the fowl. This difference in erythrocyte count is not exhibited by sexually immature fowls.

Chick diseases in Michigan: Their cause, recognition, prevention, and control, H. J. Stafseth (*Mich. Agr. Col. Ext. Bul. 53* (*1928*), *pp. 14, figs. 2*).—This is a practical summary of information.

Fowl-pox and its prevention, B. H. Edgington and A. Broerman (*Ohio Sta. Bimo. Bul., 13* (*1928*), *No. 6, pp. 206–210*).—This practical summary of information includes a brief account of control work conducted through vaccination in 1927. In the fall of that year 1,525 pullets were vaccinated on four farms, and 469 unvaccinated birds were retained as controls in order to study the spread of pox from vaccination. The vaccine employed was prepared by grinding dried scabs from the combs of artificially inoculated fowls and mixing the powdered scabs in a glycerin-phenol solution. Only scabs from acutely affected birds were used in making the vaccine. Four methods of vaccination, including scarification of the skin, and removal of 1, 5, and 10 feathers, respectively, were tested. The vaccine was applied with a small round camel's-hair brush, the bristles of which were cut to give a desired stiffness.

The results showed no appreciable difference in the immunity conferred by the different methods of vaccination, the feather follicle method appearing to produce an immunity equally satisfactory to that resulting from a cutaneous scarification. It is concluded that while the removal of a single feather was sufficient to produce an immunity, the greater assurance of a "take" when five or ten feathers were removed makes this method of procedure more reliable. The maximum duration of immunity was not determined, although at the end of four months the immunity remained practically complete.

It is concluded that healthy young fowls from 3 to 7 months of age may be vaccinated without danger of inducing a harmful chicken-pox infection. It is recommended that all susceptible fowls on the premises be vaccinated, and that pullets be so treated while on the range before their combs are fully developed as this will greatly reduce the probability of comb pecking resulting in infection. It is pointed out that it would be unwise to use a vaccine on a poultry farm where chicken pox had never existed and when conditions were such that the infection would not likely be introduced, and that routine vaccination should be practiced only on farms where the disease has occurred.

Attempted experimental infection of chickens with tularemia, H. Theiler (*Cornell Vet., 18 (1928), No. 4, pp. 348–352*).—Transmission experiments in which suspensions of *Bacterium tularense* were administered intravenously, subcutaneously, and intraperitoneally failed to show the chicken to be susceptible to the disease.

Observations on eye worms of birds, J. W. Fielding (*Queensland Agr. Jour., 30 (1928), No. 1, pp. 37–41, fig. 1*).—The author first presents a list of 359 birds examined for presence of the eye worm, 56 of which were found infested, followed by a report of an examination made of young chickens, general sanitary and hygienic considerations, and treatment.

Incidence of coccidiosis in Australian rabbits as determined by faecal examinations, H. R. Seddon and H. R. Carne (*N. S. Wales Dept. Agr., Sci. Bul. 29 (1927), pp. 33–42*).—The incidence of coccidiosis in rabbits in the authors' examination of wild rabbits led to the conclusion that in Australia they harbor both *Eimeria perforans*, the cause of intestinal coccidiosis, and *E. stiedae*, the cause of hepatic coccidiosis. Ninety-two per cent of the 62 districts furnishing feces were found to be infested to some extent. *E. stiedae* was found in 73 and *E. perforans* in 65 per cent of the districts in which coccidiosis is known to exist.

AGRICULTURAL ENGINEERING

Some promising lines of agricultural engineering research, R. W. Trullinger (*Agr. Engin., 9 (1928), No. 12, pp. 375–378, figs. 2*).—This contribution has been previously noted (E. S. R., 60, p. 109).

The improved Venturi flume, R. L. Parshall (*Colorado Sta. Bul. 336 (1928), pp. 84, figs. 30*).—The results of studies of an improved Venturi flume are reported.

This flume has shown in field operation that it is practical under conditions which make a standard weir or rating flume impractical, either because of silting trouble or insufficient grade. The accuracy of measurement with this device is entirely within practical limits. It operates successfully with a relatively small loss of head, and for free flow this loss in a standard weir is approximately four times that in the flume. The flume will withstand a high degree of submergence without affecting the rate of free-flow discharge. The structure may be built of wood, concrete, or sheet metal.

It has been found that where the degree of submergence exceeds about 95 per cent, the indicated discharge through the flume is not wholly dependable, so that if conditions permit the discharge should be free flow or with the least possible degree of submergence. For free flow the exit velocity is relatively high, and bottom as well as bank protection must be provided to prevent erosion. Where the materials are of such a nature as to withstand a high velocity, no protection is needed.

Preventing erosion of farm lands by terracing, C. E. Ramser (*Agr. Engin., 9 (1928), No. 12, pp. 369–373, figs. 15*).—This is a contribution from the U. S. D. A. Bureau of Public Roads, presented at the 1928 meeting of the American Society of Agronomy (E. S. R., 60, p. 300). It presents a large amount of practical information on the subject.

Public Roads, [November, 1928] (*U. S. Dept. Agr., Public Roads, 9 (1928), No. 9, pp. 169–184, figs. 24*).—This number of this periodical contains the following articles: Foundation Pile-Head Bond and Anchorage Tests, by G. W. Davis (pp. 169–176); Strength Characteristics of Concrete, by A. N. Johnson (pp. 177–181); A Mechanical Traffic Counter Developed in Denmark (pp. 182, 183); Effect of Moisture on Toughness of Rock (p. 183); and Comprehensive Concrete Pavement Curing Tests Now in Progress in Tennessee (p. 184).

A dynamometer to test man's power capacity, E. G. McKibben and J. S. Winters (*Agr. Engin., 9 (1928), No. 12, pp. 393, 394, figs. 3*).—In a contribution from the California Experiment Station, this dynamometer is briefly described and illustrated and some test results reported.

Plowing draft tests on fertilizer plots, D. B. Lucas (*Agr. Engin., 9 (1928), No. 11, pp. 335–337, figs. 4*).—Studies conducted at the New Jersey Experiment Stations are reported in which it was found that the plowing draft of a soil tends to increase as the crop yield increases. This is due to (1) heavier root development and (2) greater resistance to the plow by soils of higher fertility.

It appeared, however, that the draft required to plow limed soils is less than that for unlimed soils, in spite of the normally higher yields following the liming of acid soils and the consequent increase in root development.

Results of combine studies in Pennsylvania, H. B. Josephson (*Agr. Engin., 9 (1928), No. 11, pp. 343–345, figs. 4*).—The results of an investigation by the Pennsylvania Experiment Station into the practice of combine harvesting of grains in the State are reported, which showed that the combine method is yet in the experimental stage.

The combine method effected a considerable saving in the cost of harvesting wheat and oats when the straw was left on the field. However, when the straw was removed it cost more to harvest by the combine method than by binding and threshing. It appears that 100 acres per year is the minimum acreage for profitable operation of a 9-ft. combine in Pennsylvania.

Results of potato harvesting studies, H. B. Josephson (*Agr. Engin., 9 (1928), No. 12, pp. 381, 382, figs. 4*).—Studies conducted at the Pennsylvania Experiment Station are reported, the results of which indicate that harvesting requires from 42 to 54 per cent of the total labor required in producing a potato crop in the State. Picking up the potatoes, which is now entirely a hand operation, requires from 26 to 33 per cent of the labor required in producing the crop. Engine-driven potato diggers were found to do better work than traction-driven diggers. Mechanical pickers were found unsatisfactory under Pennsylvania conditions, due to the difficulty of securing good soil separation, the presence of stones, and heavy yields. It appears that lower forward speeds are necessary with high yields if mechanical potato pickers are to be used.

Experiments prove value of grinding feed, T. E. Hienton (*Agr. Engin., 9 (1928), No. 11, pp. 341, 342, figs. 3*).—The results of tests at the Indiana Experiment Station are briefly reported, indicating that grinding the whole grain in the ration for dairy cows increases production 8.5 per cent, but that excessively fine grinding does not pay.

A comparison of whole oats with coarsely ground, medium finely ground, and very finely ground oats for hogs also demonstrated that the grinding of certain grains returns a profit, but that fine grinding is not warranted.

Building implement shed is good economy, F. E. Fogle (*Michigan Sta. Quart. Bul., 11 (1928), No. 2, pp. 76, 77, figs 3*).—Practical information is presented on the planning and construction of implement sheds, together with working drawings.

Automatic control simplifies ventilation, H. H. Musselman (*Michigan Sta. Quart. Bul., 11 (1928), No. 2, pp. 59–62, figs. 2*).—Practical information on the automatic control of the ventilation of animal shelters is presented.

Dairy equipment sterilization with electricity, A. W. Farrall et al. (*Agr. Engin., 9 (1928), No. 12, pp. 383–387, figs. 5*).—This is the report of the committee on dairy equipment sterilizers of the American Society of Agricultural Engineers, presented at the twenty-second annual meeting of the society (E. S. R., 59, p. 401). It summarizes the results of work done on the subject during the year by different agencies.

The Oklahoma farmstead, L. E. Hazen (*Oklahoma Sta. Circ. 74 (1928), pp. 37, figs. 25*).—This is a practical discussion of farm homestead planning for Oklahoma conditions.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in rural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul., 13 (1928), No. 6, pp. 220–230, figs. 3*).—Results of investigations in rural economics are reported as follows:

Direct to packer buying of hogs in the United States, G. F. Henning (pp. 220–225).—Tables are included showing by months the percentage of hogs purchased direct by a group of packers in Middle Western States from January, 1920, to June, 1928, inclusive; the average monthly percentage, 1923–1927, of receipts at 64 markets and of numbers slaughtered and purchased direct; and a comparison of total slaughter, direct buying, and receipts at 64 markets for the 5 winter and fall months, 1920–1928, and the 7 spring and summer months, 1920–1927.

The percentage of hogs purchased direct increased from 20.2 in 1920 to 32.4 in 1927. With few exceptions, a greater percentage of the total number slaughtered was purchased direct during the months of October to February, inclusive. The data for the 7 years seem to show that packers increase the proportion of hogs purchased direct to the total number slaughtered during periods of increase in the hog-marketing cycle, hold or sometimes slightly decrease the percentage with the peak in the cycle, hold about the same proportion during the period of decrease in receipts, and increase the proportion during the next period of increasing receipts.

Seasonal changes of Cleveland and Pittsburgh milk prices, R. U. Battles (pp. 225–227).—A table is given showing the percentage change of milk prices for each month from 1914 to 1927 on the Cleveland and Pittsburgh markets, and a graph showing the trend of the prices in the two markets in surplus and deficit seasons. The table and graph show that the winter prices have decreased and the summer prices increased in both markets, the changes being the greater in the Cleveland market.

Ratio of poultry feed to the price of eggs and poultry, J. H. Sitterly (pp. 227, 228).—A table and chart are given comparing by years from 1910 to 1927, inclusive, the cost of 100 lbs. of a poultry ration (corn 45 lbs., wheat 35, oats 10, and meat scrap 10 lbs.) and the price of 6 doz. eggs and 4.3 lbs. of poultry.

Ohio farm expenses, J. I. Falconer (p. 229).—The index number previously noted (E. S. R., 56, p. 182) is continued for 1927 and 1928, the weighted indexes for the two years being 158 and 162, respectively.

Index number of production, prices, and income, J. I. Falconer (p. 230).—The table of indexes previously noted (E. S. R., 60, p. 199) is brought down through August, 1928, and a new index, "Prices paid by farmers for commodities bought: U. S.," is added covering the period of the table, 1913 to August, 1928.

Studies in Vermont dairy farming.—IV, Cabot-Marshfield area, E. W. Bell (*Vermont Sta. Bul. 283 (1928), pp. 24, figs. 4*).—This bulletin is the fourth of the series previously noted (E. S. R., 58, p. 783) and is based upon data obtained from 138 dairy farms for the year ended September 30, 1926.

A gross correlation analysis was made of the data, using butterfat production per cow and cost per pound of butterfat as dependent factors, and (1) pounds of concentrates fed annually per cow, (2) pounds of roughage fed annually per cow, (3) pounds of digestible protein fed annually per cow, (4) pounds of total digestible nutrients fed annually per cow, (5) hours of labor annually per cow, (6) percentage of herd freshening in September to and including December, (7) pounds of digestible carbohydrates and fat fed annually per cow, (8) percentage of year's production secured during the stabling period, (9) percentage of concentrates fed during the pasture season, (10) average value per cow in each herd, (11) nutritive ratio of the entire ration, and (12) percentage of total digestible nutrients derived from concentrates as independent factors. Tables are given showing the coefficients of gross correlations.

Multiple correlation analysis of butterfat production per cow with factors 1, 3, 5, 7, 8, 9, and 10 mentioned above gave a coefficient of 0.6736, and with the four most important factors, pounds of grain fed per cow annually, hours of labor spent per cow annually, percentage of concentrates fed during the pasture season, and average value per cow gave a coefficient of 0.6662. The coefficients of determination for the four factors were total pounds of concentrates fed per cow 22.37 per cent, total hours of labor spent per cow 3.68 per cent, percentage of concentrates fed during the pasture period 12.97, and average value per cow 5.86 per cent.

The analysis showed that on the average each increase of 100 lbs. in concentrates fed per cow increased butterfat production 4 lbs., each 10 hours of labor 1.6 lbs., each 1 per cent in proportion of concentrates fed during pasture season 2.7 lbs., and each $1 in average value per cow 1.4 lbs..

A curvilinear analysis showed that with 17 per cent of the concentrates fed during the pasture season each 100 lbs. of concentrates produced 32.8 lbs. of butterfat when 500 lbs. were fed annually, 15.1 lbs. when 1,300 lbs. were fed, and 11 lbs. when 1,900 lbs. were fed. There was no indication of curvilinearity in the net relationship of the factor hours of labor per cow. Production of butterfat per cow increased steadily as the percentage of concentrates fed during the pasture season increased up to 34 per cent. Further increases resulted in slight decreases in production. A slight amount of curvilinearity was indicated in the relationship of butterfat production per cow to average value per cow.

Cattle-ranch organization in the mountains of Colorado, R. T. Burdick, M. Reinholt, and G. S. Klemmedson (*Colorado Sta. Bul. 342 (1928), pp. 62,* *figs. 14*).—This is a companion bulletin to that previously noted (E. S. R., 59, p. 180) and is based upon records kept on 32 ranches in the North Park, the San Luis Valley-Gunnison, and the eastern foothills areas of Colorado during the period 1922–1925. Fourteen records covered 4 years, three 3 years, fourteen 2 years, and one 1 year. The data are analyzed and discussed under the headings of organization of ranches studied, ranch management, marketing cattle, and profitable ranch organization.

Tables are given showing for the period for the several ranches the number of cattle of different kinds, land owned and leased, use and value of owned and leased land, distribution of capital invested, distribution of indebtedness, sources of receipts, distribution of expenses, income and percentage on investment, net cash income, number of cattle sold by classes, percentage of growing cattle sold at various ages, comparison of ranch and central market sale prices, and market expense per 100 lbs. by areas. Other tables show by years for the several ranches the percentage of return on investment, ranch expense per head and per 100 lbs. of beef produced, winter feed per head, calf crop, ranch labor, and average sale weights by classes. A detailed study is made and tables are given showing the organization and returns on four of the ranches.

The study was made in cooperation with the Bureaus of Agricultural Economics and Animal Industry, U. S. D. A.

An economic study of the hog enterprise in Humboldt County, J. A. Hopkins, jr. (*Iowa Sta. Bul. 255* (*1928*), *pp. 65–110*, *figs. 14*).—This bulletin is based upon data obtained from census and assessors' reports, 233 farm survey records, and 159 detailed records for the years 1922–1924, secured in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

The economic conditions during the period, the place of hogs in the farm organization, farm organization in Humboldt County, crop utilization, and farm income in the county are discussed, and the detailed records are analyzed in regard to costs, economy in the maintenance of the breeding herd and in fattening the pigs, relation of breeding herd to costs and profits, size of the hog enterprise and profits, costs of gains, and effects of variations in cost factors. Appendixes explain the method used in studying the data, being that of Wallace and Snedecor (E. S. R., 56, p. 330), and tables are given showing the averages and variations in the factors studied and the influences of different factors on number of pigs weaned, rate of gain, cost of gains, pork production per bushel of corn, returns per bushel of corn, and profits.

One additional strong pig farrowed per litter increased the number weaned 0.6 pig. More than the average number of weak pigs farrowed per litter reduced the average size of the litters weaned. Each 10° below normal temperature shortly after farrowing was associated with losses of about 5 per cent of the pigs. The greatest factor affecting the cost was corn prices. An increase of 10 cts. per bushel increased the cost of pork produced 92 cts. per 100 lbs. When 100 lbs. of pork was worth one more bushel of corn, the profit per 100 lbs. increased 34 cts. Pigs weaned at a cost of $1 per head less than the average cost 98 cts. per 100 lbs. less when marketed and returned 13 cts. more per bushel for the corn fed. An additional gain of 0.1 lb. per day resulted in lowering the cost per 100 lbs. of pork 64 cts. and gave an increased return of 5 cts. per bushel for the corn fed. The addition of a mineral mixture to rations deficient in minerals gave nearly 5 cts. per bushel greater return on the corn fed.

Factors affecting the farm income, E. B. Hill (*Michigan Sta. Quart. Bul.*, *11* (*1928*), *No. 2*, *pp. 47–51*, *fig. 1*).—This is the second of a series of articles previously noted (E. S. R., 60, p. 83), and analyzes the data with a view of determining the influence of the amount of livestock kept and the production per animal on the financial success of the farmers.

In the different size groups the receipts and net increases of livestock averaged from 60 to 66 per cent of the total income on farms with the higher profits and from 45 to 64 per cent on farms with the lower profits. A table is given showing for the higher and lower profit farms in 1928 in the different size groups the average farm income, labor and management wage, acres in farms, number of cows, value of dairy products sold per cow, cattle increase per cow, number of sows, gross income per sow, number of ewes, gross income per ewe, number of hens, and gross income per hen.

The possibilities of developing new industrial markets for farm products, R. A. CLEMEN (*Illinois Sta. Circ. 330* (*1928*), *pp. 24*).—This is an address delivered before the faculty of the College of Agriculture, University of Illinois. It is devoted chiefly to a discussion from a long-time point of view of the creation of new markets for farm products, especially through the development of new uses for the products, waste materials, and by-products.

Preparing Johnson hay for market in the Black Prairie Belt of Alabama and Mississippi, M. A. CROSBY (*U. S. Dept. Agr., Farmers' Bul. 1574* (*1928*), *pp. II+20, figs. 7*).—This gives information as to the markets and market demands, marketing methods, prices, grades, essentials of profitable production, methods of preparation for market, and four examples of hay-making practices.

Car-lot shipments and unloads of important fruits and vegetables for the calendar years 1924–1926 (*U. S. Dept. Agr., Statis. Bul. 23* (*1928*), *pp. 146*).—This bulletin shows "the origin and the number of carloads of 16 important fruits and vegetables unloaded in 36 important markets during 1924, 1925, and 1926, and the shipments by States of origin of these 16 fruits and vegetables, together with 21 other fruits and vegetables which are of lesser importance."

Marketing Kentucky poultry, D. G. CARD (*Kentucky Sta. Bul. 285* (*1928*), *pp. 111–153, figs. 12*).—This bulletin presents information regarding the principal markets for Kentucky poultry, factors affecting the demand for poultry, marketing agencies, grades and standards, market and cold storage movements, price variations and cycles, and the principal marketing problems. Some suggestions for improvements in poultry marketing in Kentucky are made, "chiefly in improving the quality of birds sold, both as to breed and condition of flesh."

Crops and markets, [November, 1928] (*U. S. Dept. Agr., Crops and Markets, 5* (*1928*), *No. 11, pp. 401–440, figs. 3*).—This number includes tables, graphs, notes, reports, and summaries of the usual types.

Foreign trade of the United States, 1790–1928: Corn and corn products, C. G. GRIES (*U. S. Dept. Agr., Bur. Agr. Econ., Foreign Sect. Rpt. 37* (*1928*), *pp. 33, pls. 2*).—This mimeographed report gives graphs showing the domestic exports of corn, including corn meal, 1858–1928, and of cornstarch, glucose, grape sugar, and hominy and grits, 1908–1928; and tables showing the annual exports, imports, reexports, net balance, and quantity and value of corn and corn meal, 1790–1928, glucose and grape sugar, 1872–1928, corn oil and corn oil cake, 1898–1928, cornstarch, 1918–1928, corn feeds, 1922–1924, and hominy and grits and other corn preparations, 1922–1928, and the shipments to Alaska, Hawaii, and Porto Rico, 1903–1928.

Local cooperative livestock marketing associations in Iowa since 1920, D. A. FITZGERALD (*Iowa Sta. Bul. 254* (*1928*), *pp. 63, figs. 15*).—This bulletin reports the results of a follow-up study of that made by Nourse and Hammans (E. S. R., 46, p. 90). The data were gathered in the fall of 1925 and the spring of 1926, personal visits being made to a majority of the local associations. The development and present methods of operation, the marketing of Iowa's livestock, and the problems of the local livestock shipping associations of the State are described and discussed.

During the period between the two studies cooperative shipping associations increased, and about 50 per cent of the farmers in the State in 1924 were using such associations to a greater or lesser extent, but the proportion of the total shipments handled by cooperative associations remained practically the same. Organization and management were strengthened, and in 1925, 68 per cent of the associations were incorporated, as compared with 34 per cent in 1920. Incorporated associations averaged 105 cars shipped, as compared with 92 cars by unincorporated associations. In 1924 associations in which managers had complete control of shipments averaged 135 cars, while those in which the managers had no control of shipments averaged only 71 cars. Most local associations were found to carry their own insurance, the cost being from 2 to 40 cts. per hundredweight. Only one-eighth of all cooperative shipments went to local packers, as compared with one-third of noncooperative shipments, and twice as large a percentage of cooperative shipments, as compared with noncooperative shipments, went to Chicago. Changing conditions in the livestock trade, such as expansion of the demand of local packers and trucking to markets, were found to be testing the efficiency of the management of shipping associations severely.

Membership relations of cooperative associations (fluid milk), J. W. Jones (*U. S. Dept. Agr. Circ. 41* (*1928*), *pp. 23*).—This study, made in cooperation with the department of rural economics of the Ohio State University and the department of agricultural economics and farm management of Cornell University, was undertaken to determine the attitude of farmers toward cooperative associations, the appreciation of the services of and the causes of dissatisfaction with such organizations, the understanding of economic principles underlying prices and marketing, and the methods used by the associations to lead the thinking of producers in their areas. It is based upon data obtained during the first 6 months of 1927 by interviewing producers in the areas of 4 cooperative milk marketing associations having from 3,000 to 45,000 active participating members.

Tables are given and discussed showing for the different areas the replies of members of associations as to their expectations regarding their organization, causes of dissatisfaction, appreciation of associations' services, opinions regarding prices and marketing services of the associations, their participation in and knowledge of the affairs of the associations and their locals, and their opinions as to the financing policies of the associations; and the replies of nonmembers of associations as to the reasons for not being members, their appreciation of the associations' services, and their opinions as to the organizations' policies.

As in the first study of the series (E. S. R., 56, p. 587), this study indicates that membership problems arise largely because of lack of information and understanding of the association and its problems and of marketing in general.

The policy of the Government toward agricultural cooperation, C. L. Christensen (*U. S. Dept. Agr., Bur. Agr. Econ., 1928, pp. 8*).—An address (multigraphed) delivered before the Institute of Politics at Williamstown, Mass., August 15, 1928.

Making rural organizations effective, J. H. Kolb and A. F. Wileden (*Wisconsin Sta. Bul. 403* (*1928*), *pp. 27, figs. 22*).—This bulletin presents in popular form the results of research pertaining to the problems of rural organizations, and is based chiefly on work previously noted (E. S. R., 59, p. 887).

Farmer leaders in the United States, P. A. Sorokin, C. C. Zimmerman, et al. (*Social Forces, 7* (*1928*), *No. 1, pp. 33–45*).—The results are reported of a study based on 2,171 of the longer biographies in Who's Who for 1925, and made for the purpose of finding the concrete characteristics of the men who play a leading or important part in the life and activities of American farmers, and to grasp some characteristics of the group of leaders and the phenomenon of leadership generally.

Tables are given and discussed showing for the individuals studied the occupational and social status, sex, age distribution, geographical distribution according to place of birth and present location, place of birth and rearing, educational status, average age at which different degrees were obtained, type of college attended, undergraduate specialty, leadership and writing, occupational shifting, and mobility.

Sources and uses of income among 300 farm families of Vinton, Jackson, and Meigs Counties, Ohio, 1926, E. L. Kirkpatrick and H. W. Hawthorne (*U. S. Dept. Agr., Bur. Agr. Econ., 1928, pp. 29, pls. 3*).—A multigraphed preliminary report of the first year's study made by the Bureau of Agricultural Economics in cooperation with the Ohio Experiment Station.

Annual family living in selected farm homes of North Dakota, E. L. Kirkpatrick (*U. S. Dept. Agr., Bur. Agr. Econ., 1928, pp. 17*).—A multigraphed preliminary report based upon 26 sets of farm management cost accounts for the calendar year 1923, 29 for 1924, and 10 for 1925, obtained by the North Dakota Experiment Station and the Bureau of Agricultural Economics.

Rural population of New York, 1855 to 1925, B. L. Melvin (*New York Cornell Sta. Mem. 116 (1928), pp. 121, figs. 42*).—This bulletin reports a statistical study made in cooperation with the U. S. Department of Agriculture and is based chiefly on the reports of the Federal censuses for 1870 to 1920, inclusive, and for 1925, and of the New York State censuses for 1855 and 1925.

The population is divided into the following classes: Cities of population of 10,000 and over; large towns of 5,000 to 9,999; small towns of 2,500 to 4,999; and rural population, including all persons outside of incorporated places of 2,500 and over, and subdivided into incorporated villages, unincorporated villages, farm, and nonfarming-nonvillage. The villages are also subdivided into large villages of 1,000 to 2,499 population, major villages of 500 to 999, minor villages of 250 to 499, and small villages of 50 to 249. The data are divided into the periods 1855–1920 and 1920–1925, and the percentage of total population, trends, and factors affecting the shifts and changes in the different classes and subdivisions are analyzed.

The total rural population declined from 60 per cent of the total population in 1855 to 17.3 per cent in 1920. The decline was both absolute and relative after 1880, and was greatest in the farming and least in the suburban counties. The farm population decreased both absolutely and relatively from 1855 to 1920, being 33.3 per cent of the total population in 1855 and 7.7 per cent in 1920. After 1890 the rate at which the farm population left the farms was accelerated during each succeeding decade. The unincorporated town, the unincorporated village, and the nonfarming-nonvillage population as a whole declined between 1855 and 1920, but increased between 1855 and 1870 and between 1900 and 1910. The decrease prevailed only in the farming and mountainous counties, there being an increase between 1900 and 1920 in the urban counties and during the entire period in the suburban counties. Incorporated villages increased in number, and their population increased from 1855 to 1910 but declined during the next decade. Nearness to cities, types of farming, and routes of travel and transportation were the chief factors determining the density and the growth of villages.

From 1920 to 1925 suburbanization was very marked, as shown by the growth of rural population in all sections of the State. Incorporated villages, unincorporated villages, and nonfarming-nonvillage population increased. The farm population in the State as a whole decreased but increased in the suburban counties. The total population in each class of incorporated villages increased at approximately the same rate in the State as a whole, but in the urban and mountainous counties the rate of increase was greatest in large villages, while in the suburban counties the minor villages grew the more rapidly. In the farming counties many incorporated villages decreased in population, and the gains of the villages that increased were less than in other counties.

A study of town-country relationships, C. R. Hoffer (*Michigan Sta. Spec. Bul. 181* (*1928*), *pp. 20*).—The results are reported of a study in cooperation with the Bureau of Agricultural Economics, U. S. D. A., to examine the effect of certain town-country relationships on community organization.

An investigation of the types of merchandising services in 353 towns, being a majority of the incorporated towns in the State with less than 5,000 population, showed that of those of the 1–500 group 78.1, 86.7, 70.3, and 70.7 per cent, respectively, had drug, general, grocery, and hardware stores. Of the towns of 501–1,000 population 67.6, 51.5, 52.5, and 59.5 per cent, respectively, had furniture, jewelry, millinery, and shoe stores. There were dry goods, men's clothing, and variety stores in 74.5, 74.5, and 56.5 per cent, respectively, of the towns of 1,001–1,500. Women's clothing stores were found in less than 20 per cent of the towns of the groups with a population of less than 3,500. Blacksmiths, physicians, billiard halls, and banks were found in 66.4, 73.4, 51.5, and 82 per cent, respectively, of the towns of 500 and less. Other services were found in over 50 per cent of the towns of different size groups as follows: Towns of 501–1,000, bakers, dentists, motion pictures, and local newspapers; towns of 1,001–1,500, lawyers, plumbers, and tailors; towns of 2,501–3,000, dyers and cleaners, electricians, florists, and laundries; and towns of 3,001–3,500, hospitals.

Questionnaires returned in 1926 by the farmers in Clinton, Eaton, Ingham, Livingston, and Shiawassee Counties showed that 47.9 per cent patronized but one trade center for banking, clothing, furniture, groceries, and hardware; 36.8 per cent two centers; 12.7 per cent three centers; 2.4 per cent four centers; and 0.2 per cent five centers. Such trade centers furnished telephone, post office, newspaper, social affairs, and church services to 78.8, 73.3, 66.9, 62.1, and 54.4 per cent, respectively, of the farmers. Two and nine-tenths per cent, 6.5, 39.7, 14.9, and 2.5 per cent, respectively, of the farmers went to larger towns, and 19.1, 20.3, 6.3, 48.4, and 44.4 per cent, respectively, to smaller towns for these services.

Questionnaires regarding organizations representing group, town, and country effort returned by 209 merchants of representative towns showed that such organizations existed in 10.6 per cent of the towns of approximately 500, 44 per cent of the 501–1,000 towns, 61 per cent of the 1,001–1,500 towns, 76.9 per cent of the 1,501–2,000 towns, and 57.1 per cent of the 2,001–2,500 towns, with an average of 32.4 per cent for all towns.

A copy of the questionnaire used in the study of community organization is included.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

A history of agricultural extension work in the United States, 1785–1923, A. C. True (*U. S. Dept. Agr. Misc. Pub. 15* (*1928*), *pp. IV+220, fig. 1*).—This monograph has been noted editorially on page 401.

Educational factors influencing the activities of farm home-makers, G. Fernandes (*Oklahoma Sta. Bul. 182* (*1928*), *pp. 14*).—This bulletin, the third of the series previously noted (E. S. R., 58, p. 788; 59, p. 487), is based upon material obtained by a house-to-house survey of about 100 farm homes in each of five counties.

The data showed that the home makers came from 24 States and 5 foreign countries. Only 69 had lived in Oklahoma all their lives, 153 had received their entire school training in the State, and 80 others part of such training in the State. Two women reported no schooling, 9 very little, 1.9 per cent some college training, 20.2 per cent some high school training. 29.8 per cent had finished the eighth grade, 28.5 per cent had finished between the fifth and seventh grades, and 12.3 per cent between the first and fourth grades. The average number of years in school was 7.5 years, being 7.8 years for wives of owners and 7.2 years for wives of tenants. Only 76 of the women had any school training in subjects relating to home making, only 16.2 per cent were associated with home demonstration work of the extension service, and only 22.6 per cent were being influenced by home economics training of daughters.

The training of teachers for agriculture evening class work, W. G. Crandall (*Fed. Bd. Vocat. Ed. Bul. 129 (1928), pp. VIII+69, figs. 11*).—This is a statement of the experiences, working facilities, operative practice, and procedure of a 4-week course given at Clemson Agricultural College in the summer of 1927 to train teachers of agriculture to do evening class work. The instruction was based upon actual participation, each man being given opportunity to organize and teach an evening class and to do follow-up work. The plan followed was in the main that developed over a 3-year period with students majoring in agricultural education at the college. A statistical study of the results of evening class work in the different centers and of the work of the 26 trainees is included.

The Danish folk school, O. D. Campbell (*New York: Macmillan Co., 1928, pp. XVI+359, pl. 1, figs. 78*).—The organization and working of the folk schools of Denmark, Norway, Sweden, and Finland are described.

Twenty-fifth general report of the Department of Agriculture and Technical Instruction for Ireland, 1926–27 (*[Irish Free State] Dept. Agr. and Tech. Instr. Gen. Rpt., 25 (1926–27), pp. V+156*).—This is a continuation of the series previously noted (E. S. R., 57, p. 387).

Bacteriology, H. W. and H. J. Conn (*Baltimore: Williams & Wilkins Co., 1926, 3. ed., pp. 453, pls. 4, figs. 59*).—This edition differs from the first (E. S. R., 49, p. 625), largely in the addition of references to literature at the ends of the chapters, the inclusion of new illustrations, the addition of a section dealing with the phenomena ascribed to the bacteriophage, corrections, and recent information.

An elementary laboratory guide in general bacteriology, H. J. Conn (*Baltimore: Williams & Wilkins Co., 1927, pp. IX+165, figs. 27*).—"This little laboratory guide is intended primarily to accompany Bacteriology by H. W. Conn and H. J. Conn [see above], when the latter is used as a textbook. References to the textbook, however, are in all instances merely collateral; and this book can be used, if desired, in courses following some other text.

"This guide is designed for elementary classes in general bacteriology; and therefore treats the subject broadly, but with little detail. It is not intended to give full practical experience in either agricultural or medical bacteriology, but is planned to give the student brief instruction in the general methods that constitute the foundations of all bacteriological technic."

Productive poultry husbandry, H. R. Lewis (*Philadelphia and London: J. B. Lippincott Co., 1928, 7. ed., rev., pp. XLIV+588, pl. 1, figs. 240*).—A revised edition of the text previously noted (E. S. R., 56, p. 892). Job analysis studies have been added for the several chapters.

A primer of agricultural economics, H. Rew (*London: John Murray, 1927, pp. 229*).—An elementary textbook covering land; farm equipment, labor, and management; fixed and current expenses; farm accounts; the law of diminishing return; methods of marketing; markets; and prices.

FOODS—HUMAN NUTRITION

Cake making in high altitudes, C. D. Fredrickson and C. C. Dozier (*Jour. Home Econ., 20 (1928), No. 8, pp. 573, 574*).—A study of variations in the formula for plain cake for successful use at an altitude of 4,700 ft. showed that in the particular recipe used a reduction of one-twelfth in fat and one-eighth in sugar and an increase of one-half in milk gave satisfactory results.

Bacteriological field studies in canning: Thermophilic contamination in the canning of peas and corn, E. J. Cameron, C. C. Williams, and R. J. Thompson (*Natl. Canners Assoc., Research Lab. Bul. 25–L (1928), pp. 56, figs. 11*).—This is the complete report of a series of field bacteriological studies initiated by the National Canners' Association during the canning season of 1926 and carried through 1927. The investigation was undertaken for the purpose of establishing the cause of outbreaks of spoilage occurring in the canning of corn and peas. Three species of thermophilic bacteria have been found responsible for such spoilage, the flat sour thermophiles, the thermophilic anaerobic bacteria, and the sulfide spoilage bacteria (E. S. R., 59, p. 91).

In the studies reported, spoilage was found to occur as the result of understerilization and was traced to an accumulation of spores of the organism in question on parts of the factory equipment rather than on the food materials themselves, although the sugar used may have furnished some of the contaminating organisms. Recommendations are given for the factory control of such spoilage. The laboratory methods employed in the investigation are summarized in several appendixes.

The calcium of cheese, K. Blunt and E. Sumner (*Jour. Home Econ., 20 (1928), No. 8, pp. 587–590*).—Analyses for calcium and nitrogen are reported of three different samples of colored and one of white American Cheddar cheese, three of domestic and one of imported Swiss cheese, and two of one brand and three of another of cottage cheese. The two rennet cheeses, Cheddar and Swiss, had an average calcium content of 1.05 and 0.71 per cent and the cottage cheeses of 0.077 per cent. In proportion to the protein and total calories the Swiss and Cheddar cheeses were also much higher in calcium. For every 100 gm. of protein the Swiss cheese furnished 3.37, the Cheddar 2.83, and the cottage cheeses 0.62 gm. of calcium. In terms of 100-calorie portions, the calculated values were 0.24, 0.16, and 0.07 gm., respectively.

The decidedly higher calcium values of the Swiss and Cheddar cheeses than of the cottage cheeses are attributed to the difference in chemical changes occurring in the making of these two types of cheese. In the former the soluble calcium caseinate of the milk is changed to the insoluble product calcium paracaseinate, while in the making of cottage cheese the acid acts upon the calcium caseinate to form free casein as the curd, with calcium lactate in solution, the greater part of which is drawn away from the precipitated casein.

Note on the effect of ingesting large amounts of pineapple juice upon the pH of the urine, C. D. Miller (*Jour. Home Econ., 20 (1928), No. 7, pp. 498–501*).—Determinations are reported of the pH value, acidity in terms of N/10 NaOH, and ammonia nitrogen of the urine of four healthy young women before and after the ingestion of large quantities of pineapple juice.

The ingestion of the pineapple juice, from 1 to 1½ qt. daily for 3 consecutive days, was followed by an increase in the pH values of the urine and a decrease in the titrable acidity and output of ammonia. These results are thought to rule out the possibility that the burning sensation often noticed by newcomers in the Hawaiian Islands after drinking large amounts of fresh pineapple juice is a form of acidosis. A possible explanation of the irritation is the well-known presence in the juice of small crystals of calcium oxalate, which in other plant materials have been known to cause similar irritation.

The preparation of acidophilus milk, F. E. Rice (*Amer. Jour. Pub. Health, 18 (1928), No. 9, pp. 1105–1108*).—Directions are given for the home preparation of acidophilus milk from evaporated milk with incubation in a thermos bottle. A commercial culture of *Bacillus acidophilus* is used for the first inoculation and some of the milk culture for succeeding inoculations.

The copper content of milk, G. N. Quam and A. Hellwig (*Jour. Biol. Chem., 78 (1928), No. 3, pp. 681–684*).—Data are reported on the copper content, determined by the xanthate colorimetric method as modified by G. C. Supplee and B. Bellis,[4] of samples of raw whole cow's milk from different localities, sheep milk, goat's milk, pasteurized whole milk, buttermilk, and concentrated milk.

The samples of raw cow's milk did not vary widely in their copper content. With the exception of two samples from Montana with values of 0.26 and 0.28 mg. per liter, the variations were between 0.37 and 0.52 mg. per liter. Three samples of sheep milk gave values of 0.45, 0.50, and 0.50 mg., respectively. Goat's milk was much lower in copper content, the values for six samples ranging from 0.19 to 0.25 mg. Processed milk had a much higher content. Three samples of pasteurized milk from one factory gave values of 0.6, 0.7, and 0.63 and three from another factory 1.6, 1.5, and 1.6 mg. per liter. The values for buttermilk were between 2.4 and 2.5 mg. per liter. The concentrated milk samples were four common brands of condensed or evaporated milk with values of 2.32, 1.8, 1.8, and 2.7 mg. per liter, respectively. It is pointed out that in all of the concentrated milk samples the copper was higher than could be accounted for in the original raw products, and is thought to be due to the copper surface of the tanks in which the milk was concentrated.

The relation of copper to the hemoglobin content of rat blood.—Preliminary report, J. S. McHargue, D. J. Healy, and E. S. Hill (*Jour. Biol. Chem., 78 (1928), No. 3, pp. 637–641*).—In this paper, reporting work completed before the publication of the paper by Hart et al. showing the significance of copper in hemoglobin regeneration (E. S. R., 59, p. 893), evidence leading to the same conclusion is described.

Dried fresh calf liver was ashed and the copper removed from a portion of the ash by suitable means. Solutions of the ash before and after the removal of the copper were fed as supplements to skim milk to groups of young rats rendered anemic by skim milk. At the end of 6 weeks the general appearance of those receiving the copper-containing liver ash was much better and the hemoglobin content of the blood much higher than of those receiving the ash from which the copper had been removed. Analyses for ash constituents, nitrogen, and total sulfur are reported for the liver used in the study and also for cow's blood. On the moisture-free basis the liver contained 0.0125 per cent of copper and 0.0358 per cent of iron. Corresponding figures for the dry blood serum were 0.0044 and 0.014 per cent, respectively.

The reaction of the intestinal contents of dogs fed on different diets, W. R. Graham and E. S. Emery, jr. (*Jour. Lab. and Clin. Med., 13 (1928), No. 12, pp. 1097–1108, figs. 3*).—Data are reported on the H-ion concentration, as determined colorimetrically, of the contents of segments of the intestines of 9 dogs, 3 on a normal diet and 2 each after 2 weeks on high protein, high carbohydrate, and high fat diets, respectively. With two exceptions the dogs were killed instantaneously 24 hours after the last feedings and the determinations made immediately.

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[4] Jour. Dairy Sci., 5 (1922), No. 5, pp. 455–467.

The results agree for the most part with those previously reported by Grayzel and Miller (E. S. R., 58, p. 897). On all the diets the reaction varied from pH 6.2 to 6.5 in the duodenum, became gradually more alkaline toward the ileocecal valve, and then dropped rather sharply to acid in the cecum.

The food requirements of the infant, L. Findlay (*Pub. Health [London], 42 (1928), No. 1, pp. 5–12, figs. 10*).—In this general discussion, based upon the author's clinical experience and published investigations of others, emphasis is placed on the importance of examining the stools of infants suffering from disorders supposedly of nutritional origin in order to determine whether the condition may not be one of inanition. Two general rules are advanced: "(1) Never omit to examine the motions in any nutritional disease of infancy. (2) Never conclude that an infant is suffering from disease or being fed on an unsuitable diet until you are sure it has received its requisite amount of food."

The development of an infant fed eight months on a soybean milk diet, E. Tso (*Chinese Jour. Physiol., 2 (1928), No. 1, pp. 33–40, figs. 3*).—A Chinese baby was fed from the age of 6 weeks for a period of 8 months on a diet consisting chiefly of soy bean milk in amounts of from 600 to 880 cc. daily, supplemented by 50 to 70 gm. of cane sugar and 0.1 per cent of sodium chloride and from time to time by cod-liver oil, orange juice, egg, spinach, etc.

During the experimental period the child increased 20.7 cm. in length and gained 4.1 kg. in weight, the growth curve comparing very favorably with American standards. Definite rickets developed in about 4 months, in spite of the fact that from 10 to 15 cc. of cod-liver oil had been given daily for a good share of the time. Metabolism experiments at the end of about 2 months showed positive balances of 1.277 gm. nitrogen, 0.041 gm. of calcium, and 0.043 gm. of phosphorus per day.

Vitamin B terminology, R. A. Dutcher et al. (*Science, 68 (1928), No. 1757, pp. 206–209*).—This note from the chairman of the committee on vitamin B nomenclature, American Society of Biological Chemists, summarizes the various suggestions which have been made concerning the terminology of the components of the vitamin B complex, including the British suggestion of B_1 and B_2, the Sherman suggestion of F and G, and the McCollum suggestion of B for the heat-labile factor and F or G for the heat-stable factor. Quotations are included from various letters containing arguments for one or another of these systems.

The influence of the daily oral administration of magnesium sulphate or lactose on the blood volumes of normal, beri beri, and fasting pigeons, O. W. Barlow and M. S. Biskind (*Amer. Jour. Physiol., 86 (1928), No. 3, pp. 594–598, fig. 1*).—A comparison is reported of changes in body weight, red cell count, and total blood volume of three groups of pigeons which had been placed, respectively, on a normal diet, polished rice, and complete fast, each with and without the daily administration of magnesium sulfate or lactose, which had been demonstrated in a previous study (E. S. R., 58, p. 594) to prevent the onset of anemia in the inanition resulting from fasting or deprivation of vitamin B.

Although the red corpuscles decreased at a rate somewhat greater than the body weight, the ratio of blood weight to body weight increased in both inanition and rice disease (polyneuritis). The administration of magnesium sulfate or lactose did not alter the volume of the blood, and consequently it is thought that the checking of the decrease in red blood cell count must be attributed to an interference with the rate of red cell destruction rather than control of the hydremia.

Pellagra-like lesions associated with deficiency of vitamin B_2 in the rat, G. M. Findlay (*Jour. Path. and Bact., 31 (1928), No. 2, pp. 353–364, pls. 2*).—In this attempt to differentiate the symptoms of a deficiency of vitamins F and G (B_1 and B_2) from those formerly ascribed to vitamin B, four groups of 10 rats each were fed from weaning a basal diet of purified casein 25, rice starch 70, and McCollum and Davis salt mixture 5 parts, with 0.2 gm. of cod-liver oil per rat per day. Group A received no addition to this diet, group B 0.5 gm. per rat per day of yeast autoclaved at 120° C. for 5 hours, and group C 0.2 cc. of the Kinnersley-Peters antineuritic vitamin concentrate.

The rats in group A showed the usual symptoms of a deficiency of vitamin B, loss of appetite, body weight, and temperature, but only 2 showed symptoms of polyneuritis. The average duration of life was 34 days. In group B (lack of vitamin F) the symptoms resembled those in group A except that paralysis was present in 6 of the 10 rats. The average duration of life was 37 days. In group C (lack of vitamin G) moderate growth occurred for from 4 to 6 weeks, followed by a period of slight but gradual loss in weight, during which time cutaneous changes developed, preceded in some cases by a sudden change in behavior, the animals becoming very irritable. The body temperature remained normal until shortly before death and, though the food intake was gradually reduced, complete loss of appetite was not evident, nor was there any appearance of the characteristic nerve symptoms of polyneuritis. The skin changes, which are described in detail, were bilaterally symmetrical and very similar to those of pellagra in man. Anatomical observations on autopsy were similar in the three groups with the exception of papillomatous changes in the cardiac portion of the stomach in the G-deficient rats. This change is similar to one observed by Pappenheimer and Larimore (E. S. R., 53, p. 165) in rats on vitamin A deficiency, and is likewise attributed to the ingestion of hair, which is shed in large amounts on the G-deficient diet.

Histological changes were similar on the three diets and are ascribed for the most part to inanition. The testicles of some of the rats deprived of vitamin G showed spermatozoa, while in all of those deprived of vitamin F there was complete absence of spermatozoa.

The probable amount of ultra-violet radiation obtained indoors through ultra-violet transmitting glass, J. H. Clark (*Science, 68 (1928), No. 1755, pp. 165, 166*).—Data are reported showing that it is necessary to sit about 15 hours at 5 meters' distance from a north window of ultra-violet transmitting glass to get as much ultra-violet radiation as can be obtained in 2 minutes out of doors in the direct sun at noon. "Any child going out for recess or any stenographer going out to lunch will get more ultra-violet radiation than she could get all day behind a window of ultra-violet transmitting glass. So, although these materials have an undoubted field of usefulness in solariums, and probably in animal houses and zoos, it is unnecessary to put them in schools and offices, where it would be cheaper and more efficient to send the individuals concerned out into the sunshine for a few minutes every day at noon."

Reproduction, lactation, and vitamin E (*Nature [London], 122 (1928), No. 3065, Sup., pp. 136–138*).—A review of recent literature.

Neuro-muscular response of rats to galvanic stimuli, A. T. Shohl and F. C. Bing (*Amer. Jour. Physiol., 86 (1928), No. 3, pp. 628–632*).—A procedure is described for determining quantitatively the neuromuscular irritability of rats to galvanic currents, and data are presented showing the amount of current required to cause muscular contraction in relation to age, sex, weight, diet, anesthesia, and death. Diets deficient in vitamins A. B, or D did not alter materially the response to such galvanic stimuli.

Rickets in rats.—VII, Metabolism of calcium and phosphorus of rats fed upon non-ricketogenic diets, A. T. SHOHL, H. B. BENNETT, and K. L. WEED (*Jour. Biol. Chem., 79 (1928), No. 1, pp. 257–267*).—Continuing the investigation previously noted (E. S. R., 59, p. 895), a study has been made of the effect upon the general behavior and growth of rats, the content of calcium and phosphorus in the blood, the composition and appearance of the bones, and the metabolism of calcium and phosphorus, of gradually improving a rachitic diet by suitable additions of salts and vitamins.

The various diets used were A, the Steenbock-Black ration 2965 plus 10 per cent of lard; B, diet A, with the addition of enough $NaH_2PO_4.H_2O$ to alter the Ca:P ratio from 4.1 to 2: diets C and D, prepared from diet B by substituting 4 gm. of butterfat and 2 gm. of cod-liver oil, respectively, for the corresponding amounts of lard: and diet E, consisting of diet D with the corn irradiated for 20 minutes at a distance of 30 in. with a Hanovia Alpine lamp.

These changes in the diet were marked by a progressive increase in the phosphorus and calcium content of the blood; changes in the histological appearance of the bones from rachitic to normal with the first alteration in the diet; Ca:P ratios of the bones of A 6, B 2.25, C 1.9, D 2.7, and E 2.4; a progressive increase in the size of the bones (with the exception of the butterfat diet); and progressive increases in weight, food consumption, and in the positive balances of both calcium and phosphorus. Of particular interest is the fact that better results were obtained when the diet was supplemented by cod-liver oil and irradiation than by cod-liver oil alone.

Rickets in rats.—VIII, Rickets and tetany, A. T. SHOHL and F. C. BING (*Amer. Jour. Physiol., 86 (1928), No. 3, pp. 633–638*).—Continuing this series of studies, the authors have tested by the method noted above the irritability of the muscles of rachitic rats before and after the healing of rickets by cod-liver oil or irradiated food and by the addition of phosphates to the diet. The Steenbock-Black rachitic diet was used for all but one group which received the Zucker diet.

Although rickets was cured in all cases, there was a marked difference in the behavior of the rats. Those cured by cod-liver oil or irradiated food were normal in behavior, while those cured by phosphates showed symptoms of tetany. The amount of current required for neuromuscular response was temporarily elevated over normal figures in the animals cured by dietary measures except in the case of those on the Zucker diet, which showed normal reaction throughout. In the rats cured by phosphates the neuromuscular reaction was typical for tetany, the amount of current required becoming very small. The irritability was less on the acid phosphate than on the alkaline phosphate.

These findings are thought to confirm the previous belief that the condition resulting from the addition of phosphates to the diet of rachitic rats should be called tetany.

Rickets in rats.—IX, pH of the feces, A. T. SHOHL and F. C. BING (*Jour. Biol. Chem., 79 (1928), No. 1, pp. 269–274*).—The reliability of the pH feces test for the cure of rickets, as first suggested by Zucker and Matzner (E. S. R., 51, p. 464) and corroborated by Jephcott and Bacharach (E. S. R., 56, p. 412) and by Redman, Willimott, and Wokes (E. S. R., 57, p. 789), has been tested on rats in which rickets had been produced by the Zucker diet or by the Steenbock-Black ration 2965 plus 10 per cent of lard, with treatment by cod-liver oil or in the case of some of the rats on the Steenbock ration irradiation of the corn, irradiation plus cod-liver oil, or the addition of phosphates. The resulting diets were equivalent per 100 gm. to 530 cc. of N/10 alkali, neutrality, and 315 cc. of N/10 acid. After the initiation of healing of the rickets, as judged by various criteria, pH determinations of the feces were made by the electrometric method checked by the colorimetric.

The feces of the rats on the Zucker diet changed from alkali to acid, the results confirming in all respects those reported by previous investigators. The reaction of the feces of the rats on the Steenbock diet was alkaline before treatment and remained alkaline in the group receiving irradiated food, was practically neutral on the diet containing irradiated corn and cod-liver oil, and became acid on this diet supplemented by acid phosphates. In other words, the reaction of the feces corresponded to the reaction of the diets used.

The authors conclude that the cure of rickets is not necessarily associated with an alteration of the pH of the feces from alkaline to acid.

Endemic goiter and public health, O. P. KIMBALL (*Amer. Jour. Pub. Health, 18 (1928), No. 5, pp. 587-601*).—In this review of the history of goiter prophylaxis in this and other countries, it is pointed out that as early as 1858 iodized salt was recommended and used in Switzerland and France, and that some years later this treatment was discredited for the same reasons that have recently been advanced in this country. Iodized salt is considered of greatest value during pregnancy.

The efficiency and safety of the prevention of goiter, O. P. KIMBALL (*Jour. Amer. Med. Assoc., 91 (1928), No. 7, pp. 454-460, figs. 5*).—This paper includes a history of the preventive measures for goiter followed in Michigan from 1923 to the present time, with data on results of these prophylactic measures, including a special study of the entire goiter population in several counties of the State where the incidence of goiter is comparatively high and the majority of the population has been using iodized salt for the past four years. This study was undertaken in view of recent criticism on the use of iodized salt as possibly inducing hyperthyroidism in long-standing goiters.

Out of 655 goitrous patients who had used iodized salt from one to four years, only 27, or 4.1 per cent, showed evidence of hyperthyroidism, while out of 419 who had used no iodine or at least none before the development of hyperthyroidism, 233, or 55.5 per cent, showed hyperthyroidism. In a resurvey of 50,134 school children, only 7 cases of hyperthyroidism were found and each of these children had a previously existing congenital goiter.

The author concludes that there is no possibility of producing goiter in children by the continuous use of iodine in amounts sufficient to prevent goiter, and that in adults there is no basis for the statement that iodized salt may induce hyperthyroidism in long-standing goiters.

TEXTILES AND CLOTHING

Government publications relating to textiles (*Washington: U. S. Dept. Com., Bur. Foreign and Dom. Com., 1928, pp. II+52*).—The publications listed on textile subjects issued by United States Government bureaus dealing with the textile industry are concerned with cotton, wool, hair, and miscellaneous fibers and manufactures thereof, silk, rayon, wearing apparel, knit goods, floor coverings, and dry cleaning and laundering.

Research in the cotton industry, edited by R. H. PICKARD (*Didsbury, Manchester: Brit. Cotton Indus. Research Assoc., Shirley Inst., 1927, pp. XV+80, pls. 10*).—Activities of the British Cotton Industry Research Association up to the end of 1926 in the Shirley Institute under the direction of the late A. W. Crossley are reviewed, the discussion dealing with some special applications of research methods; characterization of cottons by means of physical and chemical tests; researches on spinning and doubling, sizing, weaving, scour-occupied in the care of kerosene and gasoline lamps, the cost of upkeep of these lamps, and what lighting conditions are in Nebraska rural homes without electricity or gaslight.

Data were collected from 184 homes in the eastern part of the State of Nebraska. The average cost for upkeep per year per household, not including fuel, was $2.04. An average of 45 minutes per week were spent in the care of lamps in all households, and 30 minutes per week in the care of ordinary kerosene lamps in households with this type only. It was found that the intensity of illumination in Nebraska homes lighted by kerosene and gasoline lamps is far below the standards set by illuminating engineers. Methods of improvement are suggested.

A study of heat loss from flat-irons, A. G. Tyler (*Agr. Engin., 9 (1928), No. 12, pp. 391, 392, figs. 3*).—The results of a study conducted at the Minnesota Experiment Station are reported, which led to the conclusion that a good flatiron, so far as its ability to hold heat is concerned, should be compact, should be as heavy as is convenient to handle, and should have as smooth a surface as possible. It was found that any gas-heated iron has relatively more surface than any of the solid irons. The extra outside surface is of less importance than the rough inside surface, which is an extremely good radiator. Of the three ways in which heat may be lost from a flatiron, convection is the most important, followed in order by conduction and radiation.

It was also found that the best kind of stand depends on the iron. If it is an electric iron or one of the old square-back types, the best stand is the back of the iron Otherwise the best stand is of thin sheet metal having small raised bosses or some other means of keeping a film of air between the stand and the base of the iron.

MISCELLANEOUS

Fifty-first Report of the Connecticut Agricultural Experiment Station, 1927, W. L. Slate et al. (*Connecticut State Sta. Rpt. 1927, pp. XI+367+82T+XXVI, pls. 36, figs. 58*).—This contains the organization list, a report of the board of control for the year ended October 31, 1927, a financial statement for the fiscal year ended June 30, 1927, and reprints of Bulletins 290–295 and of Tobacco Substation Bulletins 9 and 10, all of which have been previously noted, and of Bulletin of Immediate Information 61, Regulations Concerning the Transportation of Nursery Stock in the United States and Canada, compiled by W. E. Britton.

Forty-seventh Annual Report of the New York State Agricultural Experiment Station, [1928], F. B. Morrison (*New York State Sta. Rpt. 1928, pp. 64*).—This contains the organization list, a review of the work and publications of the station, and a financial statement for the fiscal year ended June 30, 1928. The experimental work reported and not previously noted is for the most part abstracted elsewhere in this issue.

Michigan Agricultural Experiment Station Quarterly Bulletin, [November, 1928], edited by V. R. Gardner and A. J. Patch (*Michigan Sta. Quart. Bul., 11 (1928), No. 2, pp. 45–90, figs. 11*).—In addition to articles abstracted elsewhere in this issue, this number contains one entitled Hardigan Alfalfa Leads in Variety Tests, by H. C. Kiebler (pp. 73–75).

The Arlington Experiment Farm of the United States Department of Agriculture, compiled by E. V. A. Avery (*U. S. Dept. Agr., Bur. Plant Indus., 1928, pp. 40, pls. 2*).—This handbook for visitors is in multigraphed form, and describes the history of the farm and its present lines of work.

NOTES

Iowa College and Station.—Dr. C. L. Holmes, head of the college department of agricultural economics and chief of the agricultural economics section of the station, has resigned to become principal agricultural economist in charge of the division of farm management and costs of the U. S. D. A. Bureau of Agricultural Economics, effective March 1.

Kentucky University and Station.—Plans have practically been completed for a new building to house the dairy and poultry work and for which the last legislature appropriated $150,000.

O. H. Pinney, assistant bacteriologist in the department of public service laboratories, has resigned and has been succeeded by W. Brooks Hamilton. Wallace R. Roy has been appointed assistant chemist.

New York State Station.—Dr. John J. Willaman, professor of plant chemistry and plant chemist in the Minnesota University and Station, has been appointed chief in research (chemistry), effective April 1. Dr. Willaman fills the position vacated by the retirement of Dr. L. L. Van Slyke on February 1 after 38 years of service, and will direct all of the activities of the chemistry division.

Dr. James G. Horsfall has been appointed associate in research (plant pathology), effective February 1, vice Dr. L. K. Jones resigned, and will devote his time to a study of the diseases of canning crops.

North Dakota Station.—Howard F. McColly has been appointed assistant in agricultural engineering research, effective January 1.

Rhode Island Station.—Dr. Basil E. Gilbert, acting director since February, 1928, has been appointed director. Dr. Theodore E. Odland, associate professor of agronomy and associate agronomist at the West Virginia University and Station, has been appointed agronomist, effective February 1.

Texas College and Station.—Helge Ness, chief of the station division of botany, died December 30, 1928, at the age of 67 years. Prof. Ness was born at Bergen, Norway, November 4, 1861, and came to this country in 1879. After several years spent in Illinois, California, and Texas, he was graduated from the Texas College in 1889. Aside from a period of graduate work at Cornell University, which led to the M. S. degree in 1898, his entire career was thereafter spent at the college and station as instructor in horticulture and botany, professor of botany and horticulture, and chief of the division of botany. He was especially interested in plant breeding, notably with species of Rubus and Quercus.

Virginia College and Station.—J. G. Ferneyhough has been appointed a member of the board of visitors of the college vice J. B. Watkins resigned.

Charles J. Blair, jr., a recent graduate in business administration from the college was appointed assistant agricultural economist on January 1 and has been assigned to a project dealing with a study of orchard management. This is a cooperative undertaking between the U. S. D. A. Bureau of Agricultural Economics and the experiment stations in Virginia, West Virginia, and Pennsylvania.

Changes in Scientific Journals.—A fund of $250,000, payable in five annual installments of $50,000 each, has been made available by the Chemical Foundation, Inc., for the expansion of *Chemical Abstracts.* It is announced that this fund, together with other gifts, will permit of the publication of a second decennial index, some lengthening of abstracts, somewhat more prompt publication of material, and increased attention to the industrial phases of the subject. It is reported that the number of scientific journals now systematically abstracted is over 1,300, and that the number of abstracts published during 1927 was 32,909.

Svenska Skogvardsföreningens Tidskrift, now completing its twenty-fifth volume, announces a change in policy whereby it will be issued in four parts each year and devoted, aside from book reviews, to reports of scientific forest investigations and papers on forest research and forest economics. All articles are to be accompanied by résumés in French, German, or English, and articles of more general international interest will be published in full in one of these languages.

Beginning with 1928, the Russian soil science journals *Bulletin Pochvoveda* and *Pochvovenie* are publishing papers in the original languages as submitted.

New Journals.—*Agricultural Journal* is being issued as a quarterly by the Department of Agriculture of Fiji, replacing the *Agricultural Circular* suspended some years ago. Among the articles in the initial number are the following: Progress Report on the Coccinellidae Imported from Trinidad to Control *Aspidiotus destructor*, by T. H. C. Taylor; and Stained Cotton in Fiji and its causes, and The House Fly Problem in Fiji, both by H. W. Simmonds.

Revista Agricola de Caldas is being issued weekly as the organ of the Agricultural Society of Caldas, Colombia. The initial number contains a brief article entitled Septic Pleuropneumonia in Calves, by A. Zapata M., national veterinarian.

Miscellaneous.—The International Education Board has made a grant of $4,000 to the Canadian Society of Technical Agriculturists. This grant is to be used to finance a survey of agricultural research facilities in Canada and the publication of a graduate calendar based thereon.

The Institute for the Promotion of Agricultural Economics of the State of Rio de Janerio, Brazil, is offering a prize of 100,000,000 reis ($55,555) to the discoverer of the etiology of the mosaic of sugar cane and an efficient and practical means of combating or preventing it.

The Agricultural Bacteriological Station at Gamams, Southwest Africa, founded by the German Empire and destroyed during the World War, has been converted into an agricultural school, with a course of practical character and with a model farm attached.

According to a note in *School and Society*, the National University of Guatemala has reopened at Guatemala City. The university includes a faculty of natural science and pharmacy with schools of agricultural and industrial chemistry.

Science notes that Berea College dedicated on October 18, 1928, a new agricultural hall, for which $45,000 had been contributed by Dr. and Mrs. Joel E. Goldthwait, of Boston, Mass.

Dr. James Davidson, chief assistant entomologist at the Rothamsted Experimental Station, has been appointed head of the department of entomology at the Waite Agricultural Research Institute of the University of Adelaide.

William Newton has been appointed plant pathologist for the Dominion Department of Agriculture in British Columbia.

The Thirteenth International Physiological Congress is to meet at the Medical School of Harvard University from August 19 to 23, 1929.

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EXPERIMENT STATION RECORD

Vol. 60 April Abstract Number No. 6

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

A comparison of the titration curves of coagulated and uncoagulated egg albumin, B. M. Hendrix and V. Wilson (*Jour. Biol. Chem., 79 (1928), No. 2. pp. 389–403, figs. 2*).—In this study of the changes in chemical properties accompanying coagulation, it was observed that (1) a given quantity of native egg albumin combined with greater quantities of 0.01 N acid or base through the range pH 2.8 to pH 7.7 than did the same quantity of coagulated egg albumin, (2) 1 gm. of unfiltered coagulated egg albumin combined with more either of acid or of base than did 1 gm. of the dried coagulum, and (3) the buffer efficiency of the heat-coagulated albumin "differs markedly from that of the uncoagulated albumin."

The suggestion is offered that heat coagulation involves a decrease in the number of free carboxyl and amino groups, that "this decrease probably results from a condensation of opposite groups of adjacent molecules," and that "this condensation appears to be greater in the case of the dried coagulated egg albumin than in that of the unfiltered coagulated egg albumin."

Determination of the tyrosine content of proteins, M. T. Hanke (*Jour. Biol Chem., 79 (1928), No. 2, pp. 587–609*).—Figures for the tyrosine content of certain proteins, published by the author in 1925 (E. S. R., 55, p. 310) and subsequently criticized by Looney (E. S. R., 56, p. 13), are now stated to have been somewhat low, not by reason of such an interference by tryptophane as was suggested by Looney, but because a small, but not negligible, part of the tyrosine was precipitated with the silver salt of histidine in a stage in the determination designed to separate out the last-named amino acid.

Experimental determinations on mixtures of the pure amino acids showed no disturbing effect of tryptophane upon the determination of tyrosine by the method under consideration except when the quantity of tryptophane exceeded that of tyrosine, and the results of experiments with casein and with ovalbumin are considered as indicating the destruction of the tryptophane in the acid hydrolysis of proteins. Investigating means of eliminating the loss of tyrosine with the precipitate of the histidine and silver salt, the author found possible the precipitation of tyrosine as tyrosine-mercuric chloride directly from the crude protein hydrolysate without the preliminary removal of histidine, and he further considers consistent and presumably accurate tyrosine figures to be obtainable by the application of certain colorimetric procedures other than his own to the tyrosine fraction precipitated by the mercury procedure worked out to furnish tyrosine concentrations for his own method.

By some results of his own and by others' experiments, the author is led to the conclusion also that "the tyrosine content of a given protein appears not to be absolutely constant. This may be due to an inherent difference in the tyrosine content, changes brought about by the method of preparation, or changes produced by the process used in drying the sample for analysis."

Some recent determinations of aspartic and glutamic acids in various proteins, D. B. Jones and O. Moeller (*Jour. Biol. Chem.*, *79* (*1928*), *No. 2*, *pp. 429–441*).—Aspartic and glutamic acids were determined by modern isolation methods, including a modification of Foreman's precipitation in which barium hydroxide was used by Dakin (E. S. R., 44, p. 710) and by Schryver and his associates (E. S. R., 54, p. 408) in place of the original calcium hydroxide. Together with figures similarly obtained by a number of other investigators, the results are tabulated in comparison with figures representing for the same amino acids the highest results found on record as obtained by the ester distillation method.

The proteins for which the authors give new aspartic and glutamic acid figures are edestin, ovalbumin, ox muscle, fish muscle, arachin, glutenin, gliadin, and glycinin. In all cases wherein ester distillation results are available for comparison with those obtained by more nearly direct isolation methods, the direct methods have given the higher figures, in certain cases from four to nine times higher. "Particularly is this true for aspartic acid. . . . In the case of glutamic acid such wide differences were not found, especially in those cases where the old figures had been obtained chiefly by the separation of glutamic acid hydrochloride directly from the hydrolysates, and where the losses attendant upon the ester method of analysis were not involved."

Effect of Roentgen radiation on solutions of tyrosine and cystine, W. Stenström and A. Lohmann (*Jour. Biol. Chem.*, *79* (*1928*), *No. 2*, *pp. 673–678*, *figs. 3*).—"When tyrosine in a weak aqueous solution is exposed to Röntgen radiation it is changed in regard to the phenol group. The amount changed is proportional to the dose of radiation absorbed. It varies only slightly with the concentration, the result of high dilution being a small decrease in the efficiency of the radiation. About 0.01 mg. of tyrosine in a 0.002 per cent solution is changed by 186 kiloröntgens. $\frac{M}{N}$ is approximately $\frac{1}{12}$."

The basic amino acids of horse hemoglobin, H. B. Vickery and C. S. Leavenworth (*Jour. Biol. Chem.*, *79* (*1928*), *No. 2*, *pp. 377–388*).—It is noted that "although the physicochemical properties of different hemoglobins have received a great deal of attention in recent years, surprisingly little work has been done upon the quantitative isolation of amino acids from these important proteins."

Analyses of crystallized hemoglobin from horse blood carried out by means of direct isolation methods described in previous contributions from the same laboratory (E. S. R., 58, p. 12), gave the yields, histidine 7.64, arginine 3.32, and lysine 8.10 per cent. The silver salt of histidine was found best separated from that of arginine,—when the relative proportion of histidine to arginine is, as in the case of hemoglobin, exceptionally high,—at pH 7.4. It was further concluded from a careful examination of all the fractions that complete separations of the two silver compounds could be effected only by repeated precipitations, and that reliance could not be placed upon the nitrogen contents of the various fractions as a measure of their relative content of the two bases. "The best evidence of the actual composition of the histidine and arginine fractions is secured from the weights of their respective dinitronaphtholsulfonates and that of the lysine fraction from the weight of its picrate." Evidence is also presented upon the basis of which it is considered that Hopkins's reagent is capable of a practically complete precipitation of histidine "from a relatively pure solution of this base."

It is noted that the data recorded "are in closest agreement with the assumption that the hemoglobin molecule, weighing 66,800, yields 33 molecules of histidine, 13 of arginine, and 37 of lysine."

Solubility relationships of lactose-sucrose solutions.—I, Lactose-sucrose solubilities at low temperatures, P. N. PETER (*Jour. Phys. Chem., 32 (1928), No. 12, pp. 1856–1864, fig. 1*).—This discussion is based upon work conducted at the Bureau of Dairy Industry, U. S. D. A., and develops the following conclusions:

(1) The changes in the solubilities of lactose in sucrose solutions at 0° and —3° C. are roughly in inverse proportion to the sucrose concentration, the lactose solubility being reduced in approximately saturated sucrose to about one-half of the solubility in water. (2) By reason of the limited solubility of lactose in water at 0° and at —3°, the solubility of sucrose at these temperatures was but little affected by the presence of lactose. "The values bear an inverse relationship to the concentration of the lactose in solution." (3) Lactose may, in the presence of high concentrations of sucrose, be highly supersaturated and yet crystallize very slowly because of the high viscosity.

The bearing of these observations upon the crystallization of lactose in a number of dairy products is discussed.

The ζ-potential and the lyotropic series, D. R. BRIGGS (*Jour. Phys. Chem., 32 (1928), No. 11, pp. 1646–1662, figs. 3*).—Measurements of ion effects upon the ζ-potential of cellulose, made by a streaming potential method supplemented by such other determinations as were required to furnish the data for the equation $\zeta=\frac{\kappa_s H 4\pi\eta}{P\epsilon}$, in which η is the viscosity of the liquid, ϵ is its dielectric constant, H is the observed electromotive force across the diaphragm used at the pressure P, and κ_s is the specific conductivity of the liquid as it exists within the pores of the diaphragm constitute the principal subject of this contribution from the biochemical laboratories of the Minnesota Experiment Station. The account of the experimental work is preceded by a somewhat extensive discussion of the theoretical considerations underlying the procedure. In this work, "(1) series of ions are shown to affect the ζ-potential at an inert interface (cellulose-water) in the orders of their mobilities. These mobilities are inverse measures of the lyophility (medium-loving) capacities of these ions in water. It is from this relative lyophility of ions for the phases of the system in which they are distributed that the ζ-potential arises, and it is in this property of the ions that the lyotropic effect of ions has its theoretical foundation. (2) The effect that a salt solution has upon the ζ-potential is a function, not alone of the ion carrying the opposite charge to that of the colloid, but of all ions present in the system and to which the interference is accessible. (3) The ζ-potential is shown to vary with the concentration of the salt solution in the same manner as the variation of the partial molal free energy of a substance dissolved in a solvent varies with its concentration in that solvent, $c=a\ e^{b\zeta}$ and $c=e^{F/RT}$ being the equations defining these similar pheunomena. (4) The change in the ζ-potential with ion concentration is, in some cases at least, secondary to other free surface energy changes and not, in itself, the determining factor in the adsorption phenomenon."

The "salt error" of indicators in the colorimetric determination of pH, I. M. KOLTHOFF (*Jour. Phys. Chem., 32 (1928), No. 12, pp. 1820–1833*).—Attempting the calculation of the salt errors of indicators on the basis of the Debye and Hückel equation, the author finds that if the ionic strength of the solution significantly exceeds that of the ordinary buffers the calculated exceed the experimentally observed corrections, and that indicators of the same type moreover may show different behavior. The values given for the average salt corrections of the phthaleins, referred to an ionic buffer solution strength of 0.1, are as follows:

Average salt corrections of the phthaleins

Ionic strength solution	Average salt correction phthaleins	Correction calculated	
		$a=8\times10^{-8}$	$a=4\times10^{-8}$
0.0200	+0.11	0.13	0.15
.0100	+.13	.16	.21
.0050	+.15	.18	.23
.0025	+.16	.20	.27

"In reporting on the salt error of indicators the ionic strength and the composition of the buffer mixtures used for comparison should be mentioned. The salt correction is also dependent upon the properties of the buffer solution. Methyl orange and methyl red show very small salt errors under different conditions, and therefore are very suitable indicators. Their behavior is explained by the fact that they have a hybrid character. Quite generally it may be expected that indicators which have hybrid properties will be ideal for the measurement of pH."

A new microburette [trans. title], E. M. P. Widmark and S. L. Örskov (*Biochem. Ztschr., 201 (1928), No. 1-3, pp. 15-21, fig. 1*).—The basic feature of this device is a mercury column forced upward in a tube of capillary dimensions by a small piston actuated in turn by a micrometer screw permitting readings of the volume of fluid delivered to thousandths of a cubic millimeter. The data shown, together with the statements made concerning the possibilities of the instrument, indicate an accuracy to about 0.1 cu. mm. in the volume of fluid actually delivered.

The use of alcoholic salt solutions for the determination of replaceable bases in calcareous soils, O. C. Magistad and P. S. Burgess (*Arizona Sta. Tech. Bul. 20 (1928), pp. 481-497*).—The importance of the base-exchange complex (zeolite) to soil economy is pointed out, and the necessity for a method whereby replacable bases can accurately be determined in calcareous soils is discussed, some faults of earlier procedures as applied to calcareous soils being noted.

A method is here proposed in which methyl or ethyl alcoholic solutions of salts are used as displacing agents, preference being given to 0.1 N barium chloride in 68 per cent ethyl alcohol. The activity of such a solution was found to approach that of an aqueous solution, and the solubility of calcium carbonate in the alcoholic solution was from about 10 to 15 parts per million.

Percolation methods permit the carrying out of a large number of determinations at the same time with a minimum expenditure of time and effort to complete the analysis. The alcohol is evaporated, the barium is precipitated as chromate, and the calcium, magnesium, and other bases are determined in the supernatant liquid by the soap-titration and by precipitation methods. Alkali salts, if present, must be leached out with water before the alcoholic salt solution percolation is begun.

Methods for determining "available" soil calcium, H. D. Chapman (*Jour. Amer. Soc. Agron., 21 (1929), No. 1, pp. 92-106*).—In the preliminary study reported, it was found that the total amount of calcium leached out by carbonated water in a closed system approximates closely the exchangeable calcium in the soil, the amount leached out by the first liter showing considerable correlation with field results with alfalfa. The Neubauer method was found to give useful indications of the easily soluble calcium. A modification of the Kelley-Brown method (E. S. R., 52, p. 318), using 10 gm. of soil, shaking for a short time, and leaching to 500 cc. with normal ammonium chloride, was found to give results practically identical with those obtained by the original method. In general, a higher calcium extraction was obtained from soils growing good alfalfa than from those growing poor alfalfa.

Determination of the reaction of moor soils [trans. title], T. ARND and W. HOFFMANN (*Ztschr. Pflanzenernähr., Dungung u. Bodenk, 10 (1928), No. 4, A, pp. 219–232*).—Studies of various conditions affecting the accuracy of the determination of the reaction of moor soils are reported, and a modification of the potassium chloride extraction or suspension method based on the results is described. A considerable list of references to literature cited is given.

Absorption reactions of acid soils [trans. title], W. HILLKOWITZ (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 11 (1928), No. 4–5, A, pp. 229–264*).—The absorptive capacity for various neutral salts was found to decrease steadily with increase of acidity. Results with calcium chloride were variable, depending upon the kind and amount of replaceable bases in the soil. In this case, soils with much replaceable calcium showed low absorption for calcium; those with replaceable aluminum, high absorption. Simplified methods of determining replaceable bases are proposed. A list of references to the literature of the subject is given.

METEOROLOGY

Climatology and some of its applications, R. DEC. WARD (*Sci. Mo., 28 (1929), No. 2, pp. 156–171*).—This article defines climatology as distinguished from mteorology and indicates some of the ways in which it "is applied in the service of man," for example as related to plant distribution and growth, grasslands and grazing, irrigation, dry farming, rubber and cotton production, rock weathering, stream flow and floods, soil erosion, and various geological processes, as well as insurance and engineering construction and military problems.

As regards possible extension of the cotton-growing area, it is stated that "the day may not be so very far distant when South America may take a more important position in the world's cotton markets than it does to-day. Certain portions of Australia, also, where there is sufficient water, either supplied by the natural rainfall or obtained through irrigation, seem well suited to cotton cultivation, which may in the future be considerably developed there."

The distribution of excessive precipitation in the United States, A. J. HENRY (*U. S. Mo. Weather Rev., 56 (1928), No. 9, pp. 355–363, figs. 7*).—A study of 24-hour rains equaling or exceeding 2.5 in. is reported, which shows "that heavy 24-hour rains are frequent along the Gulf coast and in Florida, that the frequency diminishes with distance to the northward and then increases again in the lower Missouri Valley," and indicates that there is also a middle zone of lower frequency in Arkansas, Kentucky, West Virginia, and Virginia. It appears that excessive short-period precipitation except in tropical cyclones "is more apt to be an isolated than a phenomenon of general distribution."

The rainfall of New England, I–IV, J. H. WEBER (*Jour. New England Water Works Assoc., 42 (1928), Nos. 2, pp. 137–149, pls. 3; 3, pp. 278–302, figs. 21; 4, pp. 414–430, figs. 24*).—This is a series of papers based on records for 313 stations in New England and 22 in the adjoining regions of New York, Quebec, and New Brunswick for the period 1881–1925. Part 1 deals with annual rainfall, part 2 with seasonal rainfall, part 3 with mean monthly rainfall of southern New England, and part 4 with minimum and maximum monthly rainfall of southern New England. The data are summarized in tables and charts, showing the periodic and local variations in the rainfall of this region.

It is stated that "the greater portion of New England has a mean annual rainfall (including melted snow, sleet, and hail) of between 40 and 45 in. The mean values for stations with 45 years of record vary, however, from 47.29 in. at Canton, Conn., to 31.78 in. at Burlington, Vt.; stations with shorter records indicate values varying from 82.21 in. at Mount Washington, N. H., (10–20-year record unadjusted) to the adjusted value of 29.1 in. at Houlton, Me." The greatest annual rainfall recorded anywhere in the region is 121.13 in. at Mount Washington; the lowest, 16.35 in., at Howe's Brook, Me. "The greater portion of New England has at some time during the period of record experienced an annual rainfall between 55 and 60 in., and all portions, with the exceptions of the Champlain lowlands, northeastern Maine, and the Connecticut Valley in northern Vermont and New Hampshire, have recorded over 45 in. . . . Areas of 25 in. or lower are confined to northern New England, while 20 in. or lower are found only in portions of western Vermont and in northeastern Maine." The data show that the region has "a remarkably even seasonal distribution of rainfall. There are, however, considerable differences within the bounds of the New England States, particularly between the coastal rain-gauging stations and those of the interior. . . . The seasonal distributions are such that the coastal regions have their greatest mean monthly rainfall in the winter months and the least in the summer, while the far interior has an opposite distribution. Between these two regions, the monthly rainfall distribution is practically uniform."

The rainfall of northern New England, G. RICHARDS (*Jour. New England Water Works Assoc., 42 (1928), No. 4, pp. 431–456, figs. 40*).—This paper charts and discusses the mean seasonal, mean monthly, absolute maximum monthly, and absolute minimum monthly rainfall of the region, which includes Maine, New Hampshire, and Vermont.

It is stated that "the spring rainfall for the greater part of this region ranges from 8 to 11 in. Near the stormier coast it generally amounts to more than 10 in., while falling under 9 in. in northern New Hampshire and Vermont and in that part of Maine over 100 miles inland. . . . In summer the rainfall, as a whole, is somewhat heavier, mostly between 10 and 12 in. . . . The general distribution of rainfall for autumn resembles that for spring. . . . Precipitation along the coast is heavier in winter than in either spring or autumn, while becoming the lowest of any season for the interior."

Amount of solar radiation that reaches the surface of the earth on the land and on the sea, and methods by which it is measured, H. H. KIMBALL (*U. S. Mo. Weather Rev., 56 (1928), No. 10, pp. 393–398, figs. 7*).—This article gives the results of an attempt "to determine if our knowledge of meteorological conditions over the oceans, and of the relation between meteorological conditions and solar radiation intensities at the surface of the earth, is not sufficient to enable us to compute mean solar radiation intensities for different latitudes with reasonable accuracy." The author states that while the values given "must not be accepted as final," "it seems evident that with reliable climatological data the radiation intensity over the oceans may be computed with considerable accuracy."

Monthly Weather Review, [September–October, 1928] *U. S. Mo. Weather Rev., 56 (1928), Nos. 9, pp. 347–391, pls. 15, figs. 29; 10, pp. 393–433, pls. 11, figs. 12*).—In addition to detailed summaries of meteorological and climatological data and weather conditions for September and October, 1928, and bibliographical information, notes, abstracts, and reviews, these numbers contain the following contributions:

No. 9.—The West Indian Hurricane of September 10–20, 1928 (illus.), by C. L. Mitchell (pp. 347–350); San Felipe—The Hurricane of September 13, 1928, at San Juan, P. R. (illus.), by O. L. Fassig (pp. 350–352); The Middle Missouri Valley Tornadoes, September 13, 1928, by G. K. Greening, jr. (pp. 353, 354); The Rockford, Ill., Tornado, September 14, 1928 (illus.), by F. H. Weck (pp. 354, 355); The Distribution of Excessive Precipitation in the United States (illus.), by A. J. Henry (pp. 355–363) (see p 505); Recovery from Subnormal Temperatures (illus.), by I. R. Tannehill (pp. 363–367); Distribution of Rainfall at Knoxville, Tenn., by Hours, Weeks, and Months of Four Weeks (illus.), by J. F. Voorhees (pp. 368–370); and Correlations for Long-Range Forecasting, by F. Groissmayr (pp. 370, 371).

No. 10.—Amount of Solar Radiation That Reaches the Surface of the Earth on the land and on the Sea, and Methods by Which It Is Measured (illus.), by H. H. Kimball (pp. 393–398) (see p.); Heating and Cooling of Water Surfaces, by G. F. McEwen (abs.) (pp. 398, 399); A New Analysis of the Sun Spot Numbers (illus.), by D. Alter (pp. 399–401); The Periods of Solar and Terrestrial Phenomena, by H. Fritz, trans. by W. W. Reed (pp. 401–407); Winters in Western Europe, by C. Easton, trans. by W. W. Reed (pp. 408–410); West Indian Hurricanes of August, 1928 (illus.), by R. H. Weightman (pp. 411, 412); and Kansas Tornadoes, 1914–1928, by S. D. Flora (pp. 412–415).

SOILS—FERTILIZERS

Proceedings and papers of the First International Congress of Soil Science, June 13–22, 1927, Washington, D. C., edited by R. B. Deemer et al. (*Washington, D. C.: Amer. Organ. Com., First Internatl. Cong. Soil Sci., 1928, vols. 1, pp. XLI+609, pl. 1, figs. 86; 2, pp. [6]+521, figs. 72; 3, pp. XIII+706, figs. 64; 4, pp. XIII+914, figs. 179*).—A general account of this congress has previously been given (E. S. R., 57, p. 101).

In addition to an address by President Coolidge; the address of the president of the congress, J. G. Lipman, on Soils and Men (pp. 18–24); various reports, accounts of exhibits and excursions, and other matters relating to organization and administration; and obituary notes on Milton Whitney, K. D. Glinka, V. L. Omelianski, and C. C. Neustruev, these volumes contain the following addresses and papers:

Vol. 1.—Soils and Fertilizers, by C. H. MacDowell (pp. 24–31); The Bureau of Soils—Its Origin and Objects, by A. F. Woods (pp. 32–36); The Present Status of Soil Microbiology, by E. J. Russell (pp. 36–52); Present Status of Soil Investigations in Japan, by A. Itano (pp. 53–55); The Chemical Characteristics of Soil Leachings, by A. A. J. de'Sigmond (pp. 60–90); The Trend of Land Utilization in the United States and the Present Situation, by O. E. Baker (pp. 90–98); The Main Problem of Physical Anthropogeography [trans. title], by A. Penck (pp. 98–116); Dokuchaiev's Ideas in the Development of Pedology and Cognate Sciences, by K. D. Glinka (pp. 116–136); Soil Adsorption, by D. J. Hissink (pp. 170–189); Conclusions Concerning the Uniform Preparation of Soil Extracts with Hydrochloric Acid, by A. A. J. de'Sigmond et al. (pp. 189–213); Discussion of the Chemical Determination of the Nutritive Materials in Soils, by A. A. J. de'Sigmond, A. Zohls, and E. Becker (pp. 213–219); The Determination of Soil Acidity, by N. M. Comber (pp. 224–233); Outline of a Scheme for the Study of Soil Profiles, by C. F. Marbut (pp. 248–259); Outline of a Scheme for the Differentiation of Soils into Mapping Units on a Uniform Basis for All Countries, by C. F. Marbut (pp. 259–268);

Climatic Soil Regions in Sweden [trans. title], by O. Tamm (pp. 269–285); Climatic Soil Regions of Norway [trans. title], by K. O. Björlykke (pp. 285–300); Scottish Soils in Relation to Climate and Vegetation, by W. G. Ogg (pp. 301–309); Distribution of Soil Types in Spain [trans. title], by E. del Villar (pp. 310–317); Soil Map of the Iberian Peninsula [trans. title], by P. Treitz (pp. 317–321); Soils of the Mediterranean Region of France [trans. title], by M. V. Agafonoff (pp. 321–326); The Classification of Alkali and Salty Soils, by A. A. J. de'Sigmond (pp. 330–344); The Grouping of Fractions in Mechanical Analysis, by G. W. Robinson (pp. 359–365); Dispersion of Soils for Mechanical Analysis, by R. O. E. Davis and H. E. Middleton (pp. 366–377); The Mechanical Analysis of Some Scottish Soils, by D. S. Gracie (pp. 378–384); A Fundamental Error in Mechanical Analysis of Soils by the Sedimentation Method, by C. F. Shaw and E. V. Winterer (pp. 385–393); A Manometric Apparatus for the Direct Determination of Summation Percentage Curves in Mechanical Analysis, by E. M. Crowther (pp. 394–398); Nomographs for Use in Mechanical Analysis Calculations, by E. M. Crowther (pp. 399–404); A New Dynamometer Suitable for All Types of Horse and Power Drawn Implements, by W. B. Haines and B. A. Keen (pp. 405–411); The Value of the Dynamometer in Cultivation Experiments and in Soil Physics Research, by B. A. Keen (pp. 412–428); Some Physical Properties of Heavy Alkaline Soils under Irrigation (in the Sudan Gezira), by E. M. Crowther (pp. 429–433); Methods for Physical Examination of Soils, by R. O. E. Davis and J. R. Adams (pp. 434–442); The Effects of Organic Matter on the Tillage of a Clay Soil, by J. E. Chapman (pp. 443–445); The Adsorption of Water Vapor by Soils and Soil Colloids, by H. E. Middleton (pp. 446–455); Influence of Air-Drying of Soils on Their Content of Finest Particles, by L. F. Smolik (pp. 456–458); The Movement of Ground and Soil Waters, by A. F. Lebedeff, trans. by J. S. Joffe (pp. 459–494); Investigation of the Relations of Water to Soil, by J. Kopecký (pp. 495–503); The Limited Rôle of Capillarity in Supplying Water to Plant Roots, by B. A. Keen (pp. 504–511); Some Factors Affecting the Moisture Equivalent of Soils, by F. J. Veihmeyer, J. Oserkowsky, and K. B. Tester (pp. 512–534); The Suction Force of Soils and Its Demonstration in the Plant Habitat, by A. P. Kelley (pp. 535–538); Soil Temperature Records at Arlington Farm, Virginia, by L. B. Olmstead (pp. 539–546); Soil Colloids and the Textural Classification of Soils, by M. M. McCool (pp. 547–550); Methods of Determining the Maximum Molecular Moisture Holding Capacity of Soils, by A. F. Lebedeff, trans. by J. S. Joffe (pp. 551–563); and Coagulations [trans. title], by G. Wiegner (pp. 564–607).

Vol. II.—On Two New Indicator Mixtures, the Complex Indicator for pH 7.0 to 12.0 and the New Complex Indicator for pH 4.0 to 10.0; and Field Methods for the Colorimetric Determination of the pH Value of Soils [trans. title], by S. Kühn and E. Scherf (pp. 1–21); Differentiation between Acidity and Lime-Deficiency in the Case of Peat Soils, by J. Alway and I. J. Nygard (pp. 22–44); Effect of Different Kinds and Amounts of Liming Materials upon the Hydrogen Ion Concentration of the Soil, by C. O. Rost and E. A. Fieger (pp. 45–64); Influence of Adsorbed Ions on Soil Reaction, by B. Aarnio (pp. 65–76); The Lime Need of Acid Soils—The Practical Value of the Hutchinson-MacLennan Method [trans. title], by C. Brioux and J. Pien (pp. 77–83); Concerning the Accuracy of the Different Methods of Determining the Hydrogen Ion Concentration of the Soil, by C. Olsen and K. L. Lang (pp. 84–86); Soil Acidity and the Phosphate Ion, by R. R. McKibbin (pp. 87–106); Colorimetric Measurement of the Reaction of Air-Dried Soils, by D. J. Healy (pp. 107–109); On the Acidity and Adsorptive Capacity of Soils [trans. title], by N. Prianischnikow and D. L.

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The influence of clay on the growth of plants [trans. title], E. Blanck and H. Keese (*Jour. Landw., 76 (1928), No. 4, pp. 309–316*).—In pot experiments with oats on mixtures of sand and clay, the yield increased with a proportion of one of clay to nine of sand but declined with larger proportions. A direct correlation between pH value of the mixture and yield was observed.

The influence of puverizing and drying on the productiveness of the soil [trans. title], A. Achromeiko (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 11 (1928), No. 2–3, A, pp. 65–89, fig. 1*).—Drying appeared to affect productiveness more than did pulverizing. Drying the soil in the sun increased the water-soluble phosphoric acid and the organic and mineral matter, but reduced the nitrate content. Drying in the thermostat and sterilizing in steam in the autoclave produced like results, but to a greater degree. Drying in the sun and at high temperatures increased acidity somewhat. An extensive list of references to the literature is given.

Investigations on the chemical determination of soil fertility [trans. title], K. Bambers (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 11 (1928), No. 2–3, A, pp. 115–141, figs. 2*).—Drying a humus soil was found to increase the solubility of its phosphate and iron and aluminum compounds in citric acid. Comparison of various chemical methods with the results of field experiments confirmed the value of such methods in determining the amount and availability of the potash and phosphoric acid of soils.

The effect of one element of plant food upon the absorption by plants of another element, J. F. Breazeale (*Arizona Sta. Tech. Bul. 19 (1928), pp. 465–480*).—In view of the fact that "so many factors, such as adsorption or replacement, come into play when salts are added to the soil that in field tests and in pot cultures it is practically impossible to maintain in the soil solution a definite concentration of plant food readily available to the plant," it was held to be necessary for the indicated purposes of the experiments here recorded to work in solution culture exclusively. The influences under consideration were, therefore, studied by the solution culture technique and were observed under five special conditions: (1) A scarcity or minimum concentration of plant food, 10 parts per million each of nitrogen, potash, and phosphoric acid; (2) an abundance of plant food, 200 parts per million each of the three nutrients named; (3) a medium concentration of each plant food, 80 parts per million; (4) a minimum concentration of one with maximum concentrations of the other two nutrients; and (5) a maximum concentration of one with minimum quantities of the other two food elements. Wheat was used as the experimental plant, seedlings having been grown upon floating aluminum disks in the nutrient solution under investigation, after sprouting on water alone. The necessity of abundant replication in seedling experiments of any kind is especially noted.

With respect to the absorption of nitrogen by the wheat seedlings, no effect of potassium compounds, phosphoric acid, or gypsum was demonstrated. The absorption of phosphoric acid from solutions appeared to be increased slightly by nitrogen, and to be diminished by an excess of gypsum. The absorption of calcium appeared unaffected by the presence of any of the three primary nutrients. The potash absorption observed was increased by the presence of other plant foods, more especially by that of nitrogen. The carrying over of the effect of nitrogen upon potassium absorption over a period during which the nitrogen was present to a period in which nitrogen was not supplied was noted, a similar effect having also been observed in the cases of the effects of phosphoric acid and of gypsum upon potassium absorption. A close correlation of the marked effect of nitrogen upon potassium absorption with stimulation of top growth and transpiration was noted, but correlation with stimulated root growth was not detected.

"The effect of nitrogen upon the absorption of potash seems to be manifested both within the tissues of the plant while the plant is not feeding and also during the act of absorption. This is shown by the more rapid absorption when solutions containing nitrogen and potash are mixed and the plant is grown half-time in this mixture and half-time in distilled water."

Soil zeolites and plant growth, J. F. Breazeale (*Arizona Sta. Tech. Bul. 21 (1928), pp. 499–520, fig. 1*).—The experiments forming the basis for this report consisted mainly in the growing of seedlings of barley, wheat, and oats, after sprouting upon floating aluminum disks in water, in solution cultures to which potassium was supplied solely in the form of a synthetic potassium zeolite, prepared by combining sodium silicate and sodium aluminate in the molecular proportions 3 to 2, and subsequently replacing the sodium content of the resulting sodium zeolite with potassium by leaching with potassium nitrate, washing out the nitrates with water, and air-drying at ordinary temperatures. The artificial zeolite contained 52.30 per cent of silicon dioxide, 25.97 per cent of aluminum oxide, 20.34 per cent of potassium oxide, and 1.83 per cent of sodium oxide, as against a theoretical composition of 47.94, 27.09, 24.97, and 0 per cent, respectively.

To prevent interference with the analyses of the plants for absorbed potassium, by the adherence of the colloidal zeolite to the roots of the plants, the plants were set in grooves cut in the edges of stoppers of wide-mouthed bottles and the zeolite was permitted contact with the solution by suspending it in the solution in filter paper thimbles attached under the centers of the corks.

In addition to the direct measure of the absorption of the potassium from potassium zeolite suspended as described in the culture liquid, experimental comparison was made of the absorption of potassium by the seedlings from the zeolite and from potassium chloride, together with experiments on the absorption of potassium from potassium zeolites in soils held in contact with the culture liquid in the manner above indicated, etc.

The results noted led to the conclusions that the potassium occurring in soil zeolites is readily available to plants; that the presence of other salts with replaceable bases, particularly nitrates, stimulates the absorption of potassium from solutions containing potassium zeolite; that the absorption by plants of the potassium from a zeolite leaves a residue that is not acid, does not possess replacement capacity, and may consist of the broken-down zeolite components, alumina and silica, either in a colloidal condition or held together in some other manner; that the broken-down residue of the zeolite may again form a zeolite at a suitable pH value upon the addition of a salt of a replaceable base; and that soils which have lost their base-replacement capacity through ignition and acid treatment are partially restored by treatment with salt solutions of a neutral or alkaline reaction.

The hydrolysis of sodium and potassium zeolites with particular reference to potassium in the soil solution, O. C. Magistad (*Arizona Sta. Tech. Bul. 22 (1928), pp. 521–547, figs. 5*).—The experimental basis of the investigation discussed in this paper consisted in the quantitative study of the hydrolysis at various dilutions of artificially prepared sodium and potassium zeolites, with a mathematical examination of some of the relationships among the data obtained.

The extent of the hydrolysis at any dilution was shown to be a function of the amount of the H ions present in the total volume of water initially and to be capable of mathematical expression. The sodium hydroxide formed by the hydrolysis of the sodium zeolite was observed to react with alumina, "present as an impurity or as a constituent of the zeolite, or present as a constituent of the hydrogen zeolite formed, to produce sodium aluminate. The amount of alumina present in solution as sodium aluminate is a logarithmic function of the pH value of the solution," or "by plotting the logarithms of the parts per million of Al_2O_3 dissolved against pH values a straight line is obtained whose equation is

$$X = 10^{1.02\,pH-7.46}.$$

The behavior of the potassium zeolite and of its hydrolysis products was found to be similar to that noted in the case of the sodium zeolite, the amount of the alumina present as potassium aluminate appearing also as a function of the pH value, although "potassium zeolite at equal dilutions hydrolyzes less than does sodium zeolite." The derivation is demonstrated of an equation relating the parts per million of potassium "at all dilutions ordinarily met with in soils" with the cubic centimeters of water per milliequivalent of replaceable potassium, $U=501.2\ Y^{0.737}$, in which Y is the volume of water in cubic centimeters for each milliequivalent of replaceable base

A depression of the hydrolysis of the potassium zeolite by calcium zeolite was noted, this depression being less in solution charged with carbon dioxide. A mutual depression of hydrolysis appeared in mixtures of sodium and potassium zeolite. "This may be caused by the common hydroxyl ion produced and the competition of both bases for a common aluminate ion."

By means of the equation above noted, "given the concentration of potassium in parts per million at one dilution of soil to water the concentration at all other dilutions can be calculated. The agreement between values so calculated and values obtained by different investigators at various dilutions is exceptionally good."

The absorption of aluminum and iron by soils [trans. title], N. D. PRJANISCHNIKOW and E K. LUKOWNIKOW (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 10 (1928), No. 4, pp. 232–237, fig. 1*).—The absorption of iron and aluminum ions was found to increase with the acidity of the soil, the displacement of lime being more energetic with the aluminum than with the iron.

Does the supply of root-soluble plant food in fertilized and unfertilized soil change during the vegetation period? [trans. title] H. NEUBAUER, W. BONEWITZ, and A. SCHOTTMÜLLER (*Ztschr. Pflanzenernähr., Düngung u. Bodenk., 12 (1928), No. 2, A, pp. 108–114*).—In experiments with fallow and fertilized soil, using the Neubauer method (E. S. R., 50, p. 118), little or no change in the root-soluble plant food during the vegetation period was indicated.

Chemical and microbiological principles underlying the decomposition of green manures in the soil, S. A. WAKSMAN (*Jour. Amer. Soc. Agron., 21 (1929), No. 1, pp. 1–18*).—This article reviews critically, with numerous references to the literature, the progress and present status of investigations on decomposition of green manures. It deals especially with the chemical composition of the plants used as green manure, the decomposition of the various organic complexes in the plants by different groups of soil organisms, as well as the metabolism of these organisms, in their relation to the speed of liberation of nitrogen in available form, and the amount of organic matter left in residual form to increase the organic matter or "humus" in the soil.

Transformation of nitrogen in rice soil, G. Janssen and W. H. Metzger (*Jour. Amer. Soc. Agron., 20 (1928), No. 5, pp. 459–476, figs. 6*).—Changes in nitrates, nitrites, and ammonia under greenhouse conditions in soils flooded and unflooded are reported in this communication from the Arkansas Experiment Station concerning the comparative effects of green manuring, sodium nitrate, ammonium sulfate, and of no treatment upon both cropped and uncropped rice soils. The soil used for these experiments was Clarksville silt loam.

The green manuring treatment consisted in the thorough incorporation into the soil of soy bean plants, taken at the stage when the pods were well formed, and cut into small pieces. The observed nitrite concentrations did not exceed 0.25 parts per million, and "no toxic effect . . . could be expected at this concentration."

In the flooded soils treated with sodium nitrate the nitrate results dropped from 19 parts per million to a trace 2 months after cropping. "The ammonia in the same soil during the same time usually was not readable, though in a few cases . . . 6 parts per million are recorded in the flooded soils." In similar unflooded soils a nitrate reduction over a period of 2 months of from 41 to 18 parts per million was observed, with the simultaneous occurrence of traces of ammonia. "It appears that in this case nitrates were assimilated by the rice plant."

The flooded and green manure treated soils increased steadily in recorded ammonia content from 4.1 to 34 parts per million, the nitrate content remaining in this case too small for determination throughout the experimental period. In the dry soils under green manuring treatment the ammonia increased from a trace initially present to 9 parts per million during the first 2 weeks, again declining to traces only at the expiration of 6 weeks. The nitrates meanwhile had increased according to the figures obtained from 3 to 56.5 parts per million.

A decided change of the flooded soils toward alkalinity was noted in the cases of the treatment with green manure and with sodium nitrate and also in the case of the flooded soil receiving no treatment, but in the flooded soil treated with ammonium sulfate this tendency was not detected.

The conclusion is also stated that "it seems fairly well established that nitrogen in the form of nitrates does not perform a major rôle in the nutrition of rice plants. This, it has been shown, is true for two rather well-defined reasons, viz, (1) nitrates are reduced in a submerged soil and are nearly completely removed, and (2) the rice plant clearly prefers ammonia to nitrates as a source of nitrogen."

The ammonium sulfate experiment showed in the unflooded soils a decrease in the ammonia from about 27.5 parts per million to traces only during 2 months, the nitrates increasing through the same period from 4 to about 27.5 parts per million with a decrease during the following month to 13 parts per million. In the flooded soils of this experiment the ammonia dropped from an initial figure of 20.5 parts per million during 2 months to 11 parts per million, and the nitrates became undeterminable after the first analysis. In the unflooded soils nitrates were greatly reduced by cropping, the values recorded showing after 2 months 62.4 parts per million in the uncropped as against 14 in the cropped soils.

Base exchange in orthoclase, J. F. Breazeale and O. C. Magistad (*Arizona Sta. Tech. Bul. 24 (1928), pp. 609–629*).—The water solubility of potassium occurring in orthoclase varied in the experiments here recorded with the origin of the sample, the fineness of division, and the solid-liquid ratio. The authors are reported to have found potassium solubilities varying from 0 to about 300 parts per million.

In the experiments under discussion, a small percentage of the potassium in orthoclase was found to hydrolyze in water with the formation of potassium hydroxide, of which the greater part reacted in turn with alumina to form potassium aluminate. All of the samples of orthoclase examined exhibited the property of base exchange, this capacity increasing on treatment of the finely ground material with alkaline solutions, while treatment with acid solutions lessened the base-exchange capacity.

It was also found possible to destroy the base exchange properties of orthoclase by ignition, but the digestion of the ignited orthoclase with alkaline solutions sometimes resulted in the building up of a base-exchange capacity in excess of that present before ignition.

"When solid orthoclase occurs in the soil in the presence of calcium, magnesium, or sodium zeolites, an equilibrium will exist between the potassium in solution and the zeolites. The plant very probably feeds largely upon hydrolyzed zeolitic potassium. The zeolites of calcium, magnesium, and sodium may act as stabilizers in that they fix much of the soluble potassium during periods of little plant growth, and slowly liberate this potassium as rapidly as it is absorbed by plants."

Inspection of fertilizers, J. B. Smith and W. L. Adams (*Rhode Island Sta. Ann. Fert. Circ., 1928, pp. 12*).—This is the usual report of inspection analysis of fertilizers. It is noted that "a brief comparison of the first and thirtieth Annual Fertilizer Circulars reveals fewer changes than might be expected for the period. The average grade of the 93 brands sampled in 1898 was a 3.5-7.4-4.7; that of 1928, a 4.4-8.7-5.4."

Commercial fertilizers, 1927–28, G. S. Fraps and S. E. Asbury (*Texas Sta. Bul. 387 (1928), pp. 46*).—This is the usual annual fertilizer control bulletin (E. S. R., 58, p. 724).

AGRICULTURAL BOTANY

The protein metabolism of the soybean, O. K. Stark (*Amer. Jour. Bot., 14 (1927), No. 9, pp. 532–547, figs. 4*).—The influence of environmental factors on protein metabolism has not received the attention that its importance warrants, and because of neglect of these factors a comparison of the results of earlier investigations is not possible. Proper interpretation of the progress of protein hydrolysis requires that analyses be made at very much shorter intervals than have prevailed in the previous practice.

Marked and abrupt fluctuations in the alpha-amino nitrogen content occur during the development of etiolated seedlings. This curve shows not a single mode, as has been believed, but a number of rapidly successive modes.

During early germination and growth temperature considerably affects protein hydrolysis. During the later periods of development, temperature exerts no noticeable effect. The behavior of soy bean varieties is outlined. Data obtained during starvation are conflicting.

Contrary to the generally accepted hypothesis, no correlation appears to exist between protein hydrolysis and growth except during the very early periods, and this correlation is thought to be incidental rather than causal. Respiratory intensity shows no relation to alpha-amino nitrogen content.

Photosynthesis, E. C. C. Baly (*Science, 68 (1928), No. 1764, pp. 364–367.*)—This is an address given before the Royal Institution of Great Britain, in which the author reports the photosynthesis of carbohydrates in the laboratory, where an aqueous suspension of finely divided aluminum hydroxide in a stream of carbon dioxide was exposed to ultra-violet light. The method is considered to be essentially the same as that taking place in the living plant. Similar results were obtained with other finely divided metallic compounds.

Field observations on starch production in the leaves of the potato, E. J. Maskell (*Ann. Bot.* [*London*], *41* (*1927*), *No. 162, pp. 327–344, figs. 2*).—The present paper is concerned with preliminary work on one aspect of the behavior of potatoes in a manurial experiment said to have been going on for 4 years at Rothamsted.

This experiment is a comparison of the potato yield effect of potash as potassium sulfate (47.71 per cent K_2O), as potassium chloride (52.11 per cent K_2O), and as potash manure salts (27.65 per cent K_2O), the quantities being so apportioned that all plats receive the equivalent of 2 cwt. of potassium sulfate per acre. The basal manuring is 2 cwt. of ammonium sulfate and 6 cwt. of superphosphate per acre. Scotch seed of Kerr Pink potato is used. The observations thus far relate to the later growth period of the plants.

Statistical analysis of starch production shows that potassium sulfate has, though chloride has not, improved the starch production rate. Potassium sulfate also improved translocation.

The storage carbohydrate of the leaf of Gossypium, G. H. Jones (*Ann. Bot.* [*London*], *41* (*1927*), *No. 162, pp. 405, 406*).—From tests described, it is concluded that starch, and not oil, is the temporary storage product of photosynthesis in the cotton plant.

An investigation of the behaviour of pectic materials in apples and other plant tissues, M. H. Carré and A. S. Horne (*Ann. Bot.* [*London*], *41* (*1927*), *No. 162, pp. 193–237, pls. 3, figs. 9*).—The results from a microscopical study of the distribution and developmental changes undergone by the various pectic structures in the tissues of the apple fruit are correlated with those from a parallel and purely chemical study of the pectic materials present in apples of the same varieties, derived from the same sources, and kept under the same experimental conditions. The results obtained from the two investigations, conducted independently, are said to agree.

A brief description is given of the pectic framework in the pear fruit and of the changes in time which this framework undergoes. Certain structural forms assumed by the pectic compounds in the apple, as globules, appear to occur commonly in plant tissues. Other structural forms, crescents, or disks have not been observed in the tissues of most plant structures examined. The methods used in this investigation have been applied to the study of the pectic changes which occur in apples in abnormal states, as physiological and fungal diseases and artificially induced conditions, and certain preliminary results are given.

Iron requirement for Chlorella, E. F. Hopkins and F. B. Wann (*Bot. Gaz.*, *84* (*1927*), *No. 4, pp. 407–427, figs. 3*).—Claiming that an alleged lack of fundamental data as to the iron requirements of plants (both minimum and optimum amounts) is due in some cases to the failure to consider the solubility of the iron added to culture solutions, and in other cases to the failure to remove completely all the iron present as impurities in such solutions, the authors present a method of removing from culture solutions supposedly the last traces of iron by means of adsorption at alkaline reactions, and claim to have shown further that if sufficient sodium citrate is used in solutions free from precipitate, iron added subsequently will remain indefinitely in solution. In an attempt to use these methods to determine the relation of iron to the growth of Chlorella, a high minimum concentration was found which varied in the different series, being higher in those which had a higher sodium citrate content.

The hypothesis offered is that iron is active in growth only in the ionized form, and that increasing the citrate decreases the ionization of the ferric citrate present, so that while a larger total amount of iron may be present there may be little or no growth because of a low concentration of the ferric ion.

Protochlorophyll, W. H. EYSTER (*Science, 68 (1928), No. 1771, pp. 569, 570*).—From the results of studies reported the author concludes that protochlorophyll is not a decomposition product of some other organic substance, as leucophyll, but is a pigment which develops without the influence of light and changes photochemically into chlorophyll upon exposure to light. It is considered probable that this change occurs only in the presence of a specific enzyme.

Physiological anatomy of the irritable organs of some climbing plants, P. M. KANGA and R. H. DASTUR (*Ann. Bot. [London], 41 (1927), No. 164, pp. 671–675, pl. 1*).—A descriptive account is given of stages in the modification of the epidermis to serve as a sense organ for perceiving the contact stimulus in the several plants studied. Living motor tissues similar in structure to those described by Haberlandt (E. S R., 31, p. 728) are said to be observable in Passiflora and Luffa. Modes of distribution of the mechanical elements in climbing organs are described. The disposition of the mechanical tissues is correlated with the symmetry of the organ. In radially symmetrical organs, as twining stems and some tendrils, a centripetal tendency in the arrangement of the mechanical tissue is evident. In bilateral organs the mechanical elements occur on the concave and convex sides, those on the concave side being greater in amount than on the convex side.

The meristematic tissues of the plant, J. H. PRIESTLEY (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc., 3 (1928), No. 1, pp. 1–20, figs. 8*).—"The above analysis of the conditions which govern meristematic activity is, of necessity, to a large extent speculative. There is, however, a certain amount of experimental evidence to support it, and with its help otherwise disconnected phenomena fall into place."

Plant stimulation [trans. title], B. MAGRINI (*Arch. Farmacol. Sper. e Sci. Aff., 44 (1927), Nos. 4, pp. 93–96; 5, pp. 97–122*).—Noting the previous work of Lo Monaco (E. S. R., 54, p. 722), the author gives details and tabulations, with discussion, regarding the ascertained stimulating influence of chemical fertilizers and other organic and inorganic substances on seed germination and during early periods of plant growth.

The water requirement and cell-sap concentration of Australian saltbush and wheat as related to the salinity of the soil, F. M. EATON (*Amer. Jour. Bot., 14 (1927), No. 4, pp. 212–226, pl. 1, figs. 2*).—When Australian saltbush and wheat were grown on a soil to which sodium chloride had been added in several concentrations, the water requirement was found (with one marked exception in the case of wheat) to be inversely proportional to the concentration of the expressed cell sap. The lower water-requirement values and higher cell-sap concentrations were obtained from the most saline soil. Wheat showed a significantly higher water requirement in the 0.05 per cent soil than on the untreated soil.

Conductivity measurements on the Atriplex sap indicated that the increased cell-sap concentrations of the plants on the more saline soils were largely attributable to electrolytes. The differences found between the freezing-point depressions of the plant sap and the soil at the moisture equivalent indicate a marked osmotic gradient between the sap and the soil solution. The osmotic concentration of the soil solution, as indicated by the freezing-point method, was over twice as great at the moisture equivalent percentage in a soil containing 0.25 per cent of added sodium chloride as the depression which would have been produced in a true solution by a like salt concentration.

The toxicity of tissue juices for cells of the tissue, S. Prát (*Amer. Jour. Bot., 14 (1927), No. 3, pp. 120–125*).—Cells from potato tubers, from the epidermis of Bryophyllum, and from onion scales can live much longer in tap water or diluted sea water than in their own juice. The expressed sap is, therefore, regarded as toxic. When the juice has been neutralized the cells live longer, but in many cases they do not live so long in their own neutralized sap as in isotonic sea water having the same pH value. It is thought that other factors besides the pH value may condition the toxicity.

Toxicity as evidenced by changes in the protoplasmic structure of root hairs of wheat, R. M. Addoms (*Amer. Jour. Bot., 14 (1927), No. 3, pp. 147–165, pls. 2*).—In root hairs examined with a cardioid ultramicroscope to detect the effects of certain so-called toxic substances or toxic concentrations on the colloidal structure of protoplasm, it was found that at a concentration of 0.1 N salts of potassium, sodium, calcium, magnesium, zinc, and aluminum produce characteristic alteration of the colloidal structure of the cell. This alteration appears as a coagulation, and in case of some salts a flocculation, of the protoplasm. Although cations are in most instances the effective agents, certain anions, as aluminate and cyanide, seem to produce an effect. Ultra-violet light having wave lengths shorter than 300 $\mu\mu$ may also cause coagulation and flocculation of protoplasm. Interference with the colloidal structure of protoplasm, resulting in alteration of permeability and metabolism, is associated with toxicity and death.

Winter root growth of plants, F. J. Crider (*Science, 68 (1928), No. 1765, pp. 403, 404*).—The author reports that the roots of certain plants, generally thought to be dormant in winter, make definite, continuous growth at this season. This was found to be true of both deciduous and evergreen species and embraces cultivated and wild forms. The rate of root elongation per day was found to vary from 9 mm. in November, as the maximum, to 0.5 mm. in February, as the minimum.

In the study of individual species the average daily root elongation of the peach, covering the winter period from November 4, 1927, to March 31, 1928, was 2.1 mm. In contrast to this group of plants, which showed decided growth in winter, others were found which, under the same environmental conditions, make no root growth whatever. With these the period of root inactivity began about the first of December and lasted until the latter part of March.

These observations, which were made in Arizona, were on plants growing in large wooden and cement boxes provided with plate-glass fronts, which made it possible for the roots to be easily seen and checked each day.

A cytological study of dormancy in the seed of Phaseolus vulgaris, J. M. Kater (*Ann. Bot. [London], 41 (1927), No. 164, pp. 629–641, pls. 2*).—A study is outlined of seed of *P. vulgaris* at five drying stages (near full size but not yet drying, just beginning to dry, perfectly dry, permeated with water, and sprouted).

In the drying of a bean the cells of the pith are the first to show shrinkage, but eventually all of the cells in the seed shrink appreciably. In the growing bean chromatic granules appear in the cytoplasm of cotyledon cells, and more infrequently in the embryo cells In dry beans these usually occur throughout the seed. Numerous very fine starch granules are found in the cortex and pith of the hypocotyl and the radicle of developing seeds, while in the mature seed a few are found in the pith, and none in the cortex or radicle. During this drying stage the scattered chromatin granules either enter the karyosome or become evenly distributed over the inner surface of the nuclear membrane, On germination the nucleus resumes the normal condition, The nuclear changes are probably quite similar to the effect of low temperature and of plasmolysis on nuclei.

Light requirement of weeds and of cultivated plants [trans. title], R. Zillich (*Fortschr. Landw., 1 (1926), No. 15, pp. 461–470, figs. 2*).—Light requirements and developmental data are given in connection with time and conditions for *Chenopodium album, Agrostemma githago, Melandrium* sp., *Papaver rhoeas, Sinapis alba, S. arvensis, Raphanus raphanistrum, Trifolium pratense, Leontodon autumnalis, Setaria italica germanica, S. viridis, Hordeum distichum, Medicago sativa, Galium aparine, Pisum arvense,* and *Convolvulus arvensis.*

The effect of ionized air on the rate of respiration of barley seedlings, N. I. Middleton (*Ann. Bot. [London], 41 (1927), No. 162, pp. 345–356, figs. 8*).—If air passing over barley seedlings is artificially ionized by means of polonium during alternate hours, the respiration rate is greater during the periods of application of the polonium. The maximum increase noted was 29.11±5.62 per cent during the second period.

The acceleration varies according to the degree of ionization. When ionization was 20,000 times that of normal air (taken at 500^+ and 500^- ions per cubic centimeter), an increase in respiration rate resulted from both applications of the polonium. Ionization of 100,000 times the normal gives a markedly significant increase in the second period only, and with still higher ionization (1,000,000 normal) a barely significant increase occurs, if any.

The nature of the effect on respiration is obscure. It is thought to be due to the action of the ions themselves and not to the associated gaseous products, as ozone.

The effect of ionized air on the assimilation and respiration of green leaves, K. Whimster (*Ann. Bot. [London], 41 (1927), No. 162, pp. 357–374, figs. 3*).—A study of rates of respiration and assimilation in leaves of *Pelargonium zonale,* by a method in which carbon dioxide production and absorption in a closed system is followed by the use of bromocresol purple as an indicator, showed that under these conditions accurate results can be obtained.

Respiration in corn with special reference to catalase, C. W. Lantz (*Amer. Jour. Bot., 14 (1927), No. 2, pp. 85–105, figs. 4*).—It was found in these studies that an excess of peroxide retarded the action of catalase. The drying of corn seedlings at 56° C. reduced their catalase content, though this was not affected by drying at room temperature in vacuo over sulfuric acid. The soaking of corn for one hour in a 0.25 per cent solution of Uspulun prevented mold growth. This treatment showed no stimulating effect upon germination or catalase activity. During the germination of different strains of corn at all temperatures, catalase activity decreased during the early stages, though it increased in the later stages to a maximum which was followed by a decrease as the reserve food of the grain was utilized.

The highest catalase activity during germination appeared in the high oil strains, the next highest in the high protein strains, the next in the low protein strains, and the lowest in the low oil strains. Gradual accumulation of catalase occurred in corn germinating at 10°, the catalase content ultimately equaling, or nearly equaling, that occurring during germination at the higher temperatures. Catalase activity in germinating corn at 30° did not increase in proportion to the increase in metabolism corresponding to the higher temperature. Usually the catalase content at 30° was less than that at 20°. A temperature of 42° reduced markedly the catalase content of corn seedlings. Respiration increased slowly in the early germination stages and then more rapidly, while catalase activity at first decreased and then increased. Respiration increased rapidly with a temperature increase, catalase failing to show a corresponding increase.

Some correlation between catalase activity and respiration was apparent during the germination of the different strains of corn at 20° but not at 10 or at 30°.

The results obtained showed no close correlation between catalase activity and respiration. No warrant was found for concluding that catalase is the enzyme chiefly concerned in physiological oxidation. The evidence rather favored the theory that catalase prevents excessive oxidation.

The rôle of phosphate in plant respiration, C. J. Lyon (*Amer. Jour. Bot., 14 (1927), No. 5, pp. 274–283*).—A report, considered as preliminary, has been given (E. S. R., 55, p. 728) of experiments designed to test the functional relationship of phosphates to plant respiration. Additional experiments having the same bearing are discussed in the present paper. "The conclusions to be drawn from both sets of experiments, and from others performed in connection with the search for an exact understanding of the rôle of phosphate, are expressed in the conception of phosphate as a promoter catalyst for the aerobic phase of respiration. In addition there is the accepted relation to the fermentative processes in that phase of respiration which does not involve the consumption of atmospheric oxygen. This will be referred to as the anaerobic phase of respiration.

"The experiments previously reported showed that the application of neutral mixtures of the acid and alkaline phosphates of sodium (or potassium) to plant tissues results in a marked and sustained increase in the rate of production of carbon dioxide. The plant tissues were those of *Elodea canadensis* and wheat seedlings. Both aerobic and anaerobic phases of respiration were shown to be affected. The amounts of increase in the rates of production of CO_2 were quantitatively measured in a form of the Osterhout respiration apparatus [E. S. R., 41, p. 524]. The increase in the case of the wheat seedlings was found to be approximately 35 per cent. For Elodea the increase was approximately 55 per cent of the normal, except as it was modified by changes in the tissues incident or subsequent to death."

Phosphate exerts a promoter action upon potato oxidase, so that carbon dioxide is produced by an oxidation of some component in a glucose solution. Phosphate catalyzes the slow oxidation of pyrogallol and of tannic acid by atmospheric oxygen. It also promotes oxidation of pyrogallol as catalyzed by metallic iron.

Phosphate increases the production rate of carbon dioxide by anaerobic processes because of its rôle in the early stages of alcoholic fermentation. It effects an increase in the production of carbon dioxide by the aerobic phase of respiration through its action as a catalyst toward oxidases. This promoter action is equally pronounced when the enzymes are contained within the cells of such plants as *E. canadensis* or wheat seedlings. Arsenate also exhibits this catalytic property, which is partly masked by its toxic effect.

The measurement of the rate of water-vapor loss from leaves under standard conditions, B. S. Meyer (*Amer. Jour. Bot., 14 (1927), No. 10, pp. 582–591, figs. 3*).—A quantitative method is described for measuring the rate of water-vapor loss from leaves under standardized conditions. The term "standard rate of water-vapor loss" is introduced to designate the rate at which water vapor is lost from a leaf surface to a dry paper surface at 20° C. in terms of grams per hour per 100 sq. cm. of leaf surface. The maximum standard rate of water-vapor loss from the leaves of the eight species studied occurred usually between the hours of 8 and 10 in the morning.

As a result of this investigation, it is considered doubtful whether the standard rate of water-vapor loss from the leaves of a species may be taken as an adequate criterion of the relative mesophytism or xerophytism of that species.

Morphological-physiological studies on transpirational relations in the genus Triticum and their evaluation for the breeding and ecology of cultivated plants [trans. title], A. SCHEIBE (*Angew. Bot., 9 (1927), No. 2, pp. 199–281, figs. 18*).—For morphological-ecological form characterization the concept surface development gives the clearest conception. On comparison, the quotients surface : volume and surface : fresh weight give equally expressive results. Physiologically, transpiration : fresh weight gives the clearest idea regarding water-ecological relations. Xerophytes give distinctly higher transpiration values than do hygrophytes, calculated on fresh weight. Particulars are given as regards forms, phases, and season of the year.

Metabolism pathology in cultivated plants [trans. title], W. MUNKELT (*Angew. Bot., 9 (1927), Nos. 1, pp. 35–65, fig. 1; 2, pp. 82–88*).—The influences on metabolism are noted of such factors as cold in stored potatoes, chlorosis in lupines, copper sulfate (0.05 per cent) in crucifers, and soil acidity.

Degenerative changes in ovules following prevention of pollination [trans. title], C. CAPPELLETTI (*Nuovo Gior. Bot. Ital., n. ser., 34 (1927), No. 2, pp. 409–490*).—The author details his work and its results in preventing artificially the fertilization of flowers of plants which normally possess in high degree the capacity to mature ovules, the list including *Digitalis purpurea, Papaver rhoeas, Delphinium formosum, Aquilegia vulgaris, Iris sibirica, Agave chloracantha, Magnolia grandiflora, Phaius maculatus*, and *P. giganteus*.

Potato tuber sprouting and the influence of diseases [trans. title], A. KOLTERMANN (*Angew. Bot., 9 (1927), No. 3, pp. 289–339, figs. 12*).—Fully ripened potato tubers are ready at once to sprout, not requiring a subsequent rest period as in the case of certain seeds. However, early separation of the tubers from the parent plant lengthens the period required for sprouting. Fullest results as regards germinability can not be obtained at once on the inception of germinability, which is followed by certain alterations in the tuber. The beginning of germinability before the arrival at a ripe stage may be brought about by the use of certain chemical and physical means, which also improve development. Die-back or other abnormalities noted of a germinal point appeared to be referable to external influences, which are indicated.

Tuberization of potatoes increased by X-rays, E. L. JOHNSON (*Science, 68 (1928), No. 1758, p. 231*).—Irradiating potatoes with a very light dose of X-rays before planting is reported to have resulted in an increase of 27 per cent in the number of tubers produced, but the average weight of the tubers was 18 per cent less than that of the controls.

Sprouted tubers irradiated before planting likewise produced a greater number of tubers per hill but with a smaller weight per tuber.

Self-protection by seeds and fruits against disinfecting media [trans. title], F. NETOLITZKY (*Angew. Bot., 9 (1927), No. 4, pp. 415–419*).—A very brief account is given of structural and chemical protectives in the seed.

The isolation of a bacteriolytic principle from the root nodules of the Leguminosae, E. R. HITCHNER (*Science, 68 (1928), No. 1766, p. 426*).—The author claims to have successfully secured a bacteriolytic agent active against leguminous root-nodule organisms. After a series of transfers in cultures a lytic principle was demonstrated which was active only against this strain of the organism. Complete lysis of young broth cultures was secured in about 24 hours after the addition of the lytic agent. Growth of the homologous organism on agar was also inhibited by the addition of this agent.

So far, attempts to produce lysis of other strains of the red clover nodule bacteria by means of this lytic agent have been unsuccessful.

The assimilation of the molecular nitrogen of the air by lower plants, especially by fungi, G. SENN (*Biol. Rev. and Biol. Proc. Cambridge Phil. Soc., 3 (1928), No. 1, pp. 77–91*).—"This short review proves that nearly every country has not only its nitrogen-assimilating bacteria but also its nitrogen-fixing fungi. . . .

"Just as green plants by assimilating carbon dioxide maintain the equilibrium of this substance and regulate its circulation, so fungi as well as bacteria by assimilating the molecular nitrogen of the air maintain the quantity of nitrogen compounds constant on the surface of the earth. Electric discharges in the atmosphere assist in this process of nitrogen regulation. Thus fungi, by the part they play in the circulation of nitrogen, aid in realizing one of the chief conditions for the continuity of life."

Tree mycorrhizas from the central Rocky Mountain region, W. B. MCDOUGALL and M. C. JACOBS (*Amer. Jour. Bot., 14 (1927), No. 5, pp. 258–266, pl. 1*).—A study of mycorrhizas on trees of 11 different species in the forests of Colorado, Utah, Idaho, and the Yellowstone National Park is said to indicate that mycorrhizas are not so abundant in the central Rocky Mountain forests as in some of the eastern deciduous forests, and that they probably do not play so important a rôle in the life of the forest mushrooms. *Pinus murrayana* yielded 7 distinct morphological forms of mycorrhizas, this being a larger number than had previously been reported from a single tree species. A form not previously reported showed the fungus mantle to be pseudoparenchymatous toward the inside and filamentous toward the outside. It is pointed out that ectotrophic mycorrhizas, in which the cortical root cells are radially elongated on one side of the root and irregular in shape on the other side, are characteristic of deciduous trees, and that they are not found on coniferous trees. On the other hand, penetration of intercellular filaments is usually much deeper in mycorrhizas of coniferous trees than in those of deciduous trees.

It is concluded that the ectotrophic mycorrhizal fungi studied are in all cases parasitic on the roots of the host plants, and that the trees are in no way benefited, but may be harmed, by the mycorrhizal relation. "Ectotrophic mycorrhizas should be classed as antagonistic nutritive conjunctive symbiotic phenomena."

GENETICS

The genetics of wheat species crosses, I, A. E. WATKINS (*Jour. Genetics, 20 (1928), No. 1, pp. 1–27, pl. 1, figs. 5*).—Investigation of the exact effect of *K*, the factor for glume differences (E. S. R., 58, p. 423), and the relation of speltoid to other wheat types resulted in the finding that the glume and rachis characters of round-glumed *Triticum vulgare*, speltoid, and spelta, the three most distinct 42-chromosome types, were due to three factors, *k*, *K*, and K_s, which form a series of multiple allelomorphs, or more probably consist of groups of completely linked factors showing a similar relationship. The view is expressed that these three factors alone or other factors in the same series suffice to account for all the principal glume and rachis types found in the 28- and 42-chromosome groups. That the extra chromosomes carry K′ was suggested by morphological comparison between appropriate types.

On the cytology of speltoid wheats in relation to their origin and genetic behaviour, C. L. HUSKINS (*Jour. Genetics, 20 (1928), No. 1, pp. 103–122, figs. 38*).—Cytological study of speltoids found and studied genetically at Svalöf and grouped by H. Nilsson-Ehle under three ratio types led to the conclusions that speltoids commonly arise from normal wheat through chromosome aberrations and that the different ratio types are determined primarily by differences in chromosome number.

Control of sex reversal in the tassel of Indian corn, J. H. SCHAFFNER (*Bot. Gaz., 84 (1927), No. 4, pp. 440–449, figs. 3*).—Experimentation with *Zea mays* is reported on, with results in which Narrow-grain Evergreen sweet corn was found to be decidedly influenced in its sexual expression by the length of the daily illumination period, and in which also the amount and degree of reversal to femaleness in the tassel were found to be subject to experimental control. Limited experiments with Country Gentleman sweet corn indicate a like condition.

The time and point of female sex determination can be thrown back to the second or third leaf nodes from the base of the plant. Whenever the female state is established in the main stem, either above or below the point of lateral ear development, the internodes become decidedly flexuous, and in extreme cases they are even thrown into loops.

Any plat of greenhouse corn can be so planted and developed that the individuals will show every gradation from the normal monoecious type (with pure carpellateness expressed in the side branches and pure staminateness in the terminal inflorescence) to an absolutely pure female condition, all the flowers of the terminal inflorescence as well as those of the lateral ears being purely carpellate.

The inheritance of albinism in the beet [trans. title], O. MUNERATI (In *Verhandlungen des V. Internationalen Kongresses fur Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 2, pp. 1137–1142*).—In studies at the Beet Culture Experimental Station, Rovigo, Italy, albinism in *Beta vulgaris* was found to be inherited only through the mother. Albino mother plants invariably yielded albino seedlings, whether fertilized with pollen from albinos or from normal plants. On the other hand, the application of albino pollen to flowers of normal plants gave rise to normal progeny only. Albino beets are believed to result from albino flowers appearing in the cluster as the result of chimeras or germinal mutations.

Heredity in Cucurbita [trans. title], R. SAVELLI (In *Verhandlungen des V. Internationalen Kongresses für Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 2 pp. 1263–1266*).—In studies at the Beet Culture Experimental Station, Rovigo, Italy, hermaphroditic flowers were very rarely observed in *C. pepo cucurbitella*, frequently in *C. pepo melopepo*, and even more often in the progeny of a cross between these two forms. Hermaphroditic blooms were never observed in *C. maxima* or *C. moschata*. Four types of flowers were observed in Cucurbita, (1) true males, (2) true females, (3) males partially female (androcarpy), and (4) females partly male (gynandromorphism). Parthenocarpy was observed commonly in strains of *C. moschata* and in one strain of *C. pepo*. Parthenogenesis, on the other hand, was never observed. Self-pollination was easily accomplished except in a few strains of *C. pepo*. Xenia was never recorded in the large number of crosses made, nor was the author able to induce mutations by exposure of the pollen to electromagnetic currents.

Inheritance in summer squashes, E. W. SINNOTT (*Connecticut Storrs Sta. Bul. 150 (1928), p. 24*).—Continuing investigations of inheritance in the squash (E. S. R., 58, p. 425), further evidence was obtained upon the independence of factors which govern fruit shape and size. A study of the segregates obtained by inbreeding suggested the existence of two dominant and cumulative flattening factors. Proof was also obtained of the existence of a factor inhibiting fruit flattening. Contrary to conflicting claims, no differences were found between the progenies of reciprocal crosses.

Further data on the genetics of "rogues" among culinary peas (Pisum sativum), C. Pellew (In *Verhandlungen des V. Internationalen Kongresses fur Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 2, pp. 1157–1181, figs. 2*).—Further evidence was obtained that crosses between normal and rogue plants of a single pea variety give rogues in the F_1 and F_2 generations. In cases of Duke of Albany and Lextonian the F_1 plants were occasionally intermediates which upon selfing yielded rogues, intermediates, and a few normals, or all rogues. F_1 rogues from normal×rogue or the reciprocal when crossed back to the normal parent gave rogues and an occasional normal and intermediate plant.

A new rogue type with exceptionally narrow leaves and low viability appeared in the F_2 of a cross between Early Giant normal and Sugar Pea rogue. This odd type is believed to be due to a recessive factor linked with those for color and time of flowering.

A peculiar case of heterosis in Phaseolus vulgaris, E. Malinowski (In *Verhandlungen des V. Internationalen Kongresses für Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 2, pp. 1090–1093, figs. 2*).—Certain plants of outstanding size, believed to be the result of heterosis, were obtained in the F_2 generation of hybrids between two varieties of kidney beans.

Linkage of size, shape, and color genes in Lycopersicum, E. W. Lindstrom (In *Verhandlungen des V. Internationalen Kongresses fur Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 2, pp. 1031–1057, figs. 5*).—As a result of studies at the Iowa State College, evidence is offered to show that size genes occur in all three of the main linkage groups in the tomato. In chromosome I the linkages are (1) smooth-pubescent fruit, (2) tall-dwarf growth, (3) oblate-ovate fruit, and (4) simple-compound inflorescence; in chromosome II red and yellow flesh color; and in chromosome III yellow and colorless skin color.

In chromosome I the smooth-pubescent and the tall-dwarf genes appeared to be intimately associated with a larger size factor. High correlation was also recorded between shape and size. The red-yellow genes of chromosome II showed appreciable linkage with size in certain crosses. In the chromosome III linkage group evidence was secured of size and color linkages in both the coupling and repulsion phases.

A haploid mutant in the tomato, E. W. Lindstrom (*Jour. Heredity, 20 (1929), No. 1, pp. 23–30, figs. 5*).—A brief account of the discovery in an F_2 generation of a dwarf tomato plant which upon testing was found to have 12 univalent chromosomes in the pollen mother cells. Attempts to use this variety as a pollen or an ovule parent met with little success, especially when the pollen was utilized. The chromosomes apparently made no attempt to pair, with an apparent but ineffectual effort to reduce in the meiotic division. Root tip cells for the most part contained only 12 chromosomes, but in rare instances variation was observed. For example, three cells were found with the diploid number of chromosomes.

Further linkage work in Pisum sativum and Primula sinensis, D. de Winton (In *Verhandlungen des V. Internationalen Kongresses für Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 2, pp. 1594–1600*).—A linkage group consisting of three factors, (1) purple flower and recessive, (2) normal stipules-reduced stipules, and (3) purple pod-green pod was determined in Pisum with linear arrangement on the chromosomes in the order of purple flower-normal stipule-purple pod. Linkage in *P. sinensis* is also discussed.

Cytological studies with fruits [trans. title], F. Kobel (In *Verhandlungen des V. Internationalen Kongresses für Vererbungswissenschaft, Berlin, 1927.*

Leipzig: Borntraeger Bros., 1928, vol. 2, pp. 927–930).—A discussion of the chromosomal composition and behavior in cultivated fruits.

Odd numbers of chromosomes were frequently observed in pear and apple varieties; for example, the count in 18 varieties of apples showed a 2n range between 36 and 49, and in 7 pears the range was between 45 and 55, the maximum being reached in the Pastoren pear. The phenomenon of apogamy observed in the Transparente de Croncels apple is attributed to irregularities in the reduction division which allow for the formation of a 2n individual without fertilization.

In cultivated forms of Prunus, on the other hand, odd numbers of chromosomes were not found, despite the fact that multiple chromosomes and irregularities in the reduction division are common. In Prunus 2-celled tetrads were a frequent phenomenon; for example, in *P. pissardii moseri* approximately 50 per cent of the tetrads were this odd type. Pollen arising in the 2-celled tetrads was diploid and was easily distinguished by large size. Upon germination these odd pollen grains gave rise to four pollen tubes.

Clonal selection in fruit stocks [trans. title], W. GLEISBERG (In *Verhandlungen des V. Internationalen Kongresses fur Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 1, pp. 761–772, figs. 5).*—Discussing the general situation in Germany in respect to the fruit stock problem, the author points out the variability in seedling stocks and emphasizes the need of the development of clonal varieties of the better types. One large German nursery is recorded as having made substantial progress in the selecting and propagating of Doucin and Paradise stocks. Vegetative mutations are cited as a contributing cause of variability in rootstocks.

Having observed that certain organic acids, particularly humic and lactic, influence rooting ability in cuttings, the author concludes that practically every wild rootstock could be made to root if the proper humus: mineral soil: sand ratio could be determined.

The relative value of homozygous and heterozygous parents in the breeding of the apple, plum, cherry, grape, and other fruits, N. E. HANSEN (In *Verhandlungen des V. Internationalen Kongresses für Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 2, pp. 796–812).*—A comprehensive review of fruit breeding investigations conducted at the South Dakota Experiment Station since 1895. The author suggests that fruits should be reduced to a homozygous condition before attempting hybridization, and urges the greater use of homozygous species in fruit breeding.

The McIntosh apple a parent in breeding new varieties, W. T. MACOUN (In *Verhandlungen des V. Internationalen Kongresses fur Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 2, pp. 1087–1089).*—That the McIntosh apple has proved a very potent parent of high quality seedlings is attested by the extended list of promising new varieties obtained from the McIntosh by open and controlled pollination at the Central Experimental Farm, Ottawa.

Heredity in the genus Fragaria, with special reference to the false hybrids of Millardet, E. M. EAST (In *Verhandlungen des V. Internationalen Kongresses für Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 1, pp. 625–630).*—Contrary to the results of Millardet (E. S. R., 6, p. 507), no matroclinous progeny was obtained at the Bussey Institution in Fragaria crosses when conducted with extreme care to prevent chance pollination. Crosses between species having different chromosome numbers, as noted by Ichijima (E. S. R., 60, p. 125), were largely unproductive of vigorous progeny. No successful crosses were completed when 7-chromosome species were pollinated with 21-chromosome species, nor when 28-chromosome species were pollinated with those having 7 chromosomes. *F. virginiana* (28 chromosomes) pollinated with *F. elatoir* (21 chromosomes) yielded a large percentage of vigorous progeny in which the dominance of *F. elatior* was striking, many of the plants being scarcely distinguishable from the pollen parent. The reciprocal cross was invariably unsuccessful. Seven-chromosome species pollinated with 28-chromosome species yielded three types of progeny (1) fertile seedlings resembling the mother parent (believed by the author to be either the result of induced parthenogenesis, induced apogamy, or of chance selfing), (2) dwarfs, and (3) plants resembling the 28-chromosome male parent.

Cytological examination by S. H. Yarnell of the dwarf hybrids failed to show the expected haploidy in the root tip tissues. The patroclinous hybrids were uniformly self-sterile.

Experimentally induced tetraploidy in ferns [trans. title], A. HEILBRONN (In *Verhandlungen des V. Internationalen Kongresses fur Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 2, pp. 830–844, figs. 17*).—A report on experiments at the University of Münster, Westphalia, in which the author was repeatedly able to induce apospory in two species of ferns.

Differential polyploidy in the genus Rosa L., C. C. HURST (In *Verhandlungen des V. Internationalen Kongresses fur Vererbungswissenschaft, Berlin, 1927. Leipzig: Borntraeger Bros., 1928, vol. 2, pp. 866–906*).—Of 1,006 forms of Rosa examined, 674 by the author, 377 were diploids with 7 gametic chromosomes and the balance polyploids with 7 as the basic number. The chromosomes were observed to function in sets of 7 (septets), of which there were apparently 5 differential types, each of which carried a specific complex of genes. The characters of the five sets designated as A, B, C, D, and E are outlined and the genetic composition of various forms of roses discussed.

[Studies in animal genetics at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 150 (1928), pp. 19–23*).—The results of the following investigations are briefly noted (E. S. R., 59, p. 430):

The factors involved in the hatching of eggs.—The breeding data indicate that the chondrodystrophic type of embryo is probably not inherited, but may be determined maternally. There was indication of an inhibition in the development of the thymus, thyroid, and parathyroids of the abnormal types, and a larger number of embryonic red cells, basophiles, and eosinophiles, with a deficiency of the mononuclear and small lymphocytes at hatching time. In four strains of creeper fowls it has been found that approximately 25 per cent of the embryos die during early incubation, indicating that a single gene determines the lethal action. Histological study of the developing creeper embryos showed slight deviations in cartilage differentiation somewhat resembling chondrodystrophy—a retardation in the growth in length and acceleration of growth in width The absence of the homozygous type of Frizzle fowl from breeders' flocks is probably not due to the death of homozygous embryos, since there was no period of high embryo mortality. Studies of the effect of different electrolytes on the development of the chick embryo have indicated that in chlorides the degree of toxicity is a direct function of the concentration of the solution, whereas in the sulfates and bromides certain concentrations are more toxic than the next higher or next lower concentration. The lethal effect is attributed to a change in the viscosity of the egg contents.

Inheritance of morphological characters in poultry.—Anatomical studies of fowls presenting the intermediate rumpless characteristic have shown that the vertebrae are mostly present in the synsacral region, but are reduced and fused, females showing a greater reduction in the vertebral column than males. The rumpless gene modified by other factors is considered responsible for this condition. In the hereditary type of rumpless fowl two vertebrae are missing from the center of the synsacral complex, while in the accidental or nonhereditary type the last two synsacral vertebrae are missing, indicating to some extent independent determination of vertebral elements. The results from crossing Silky and Leghorn fowls, continued into the fourth generation, confirmed previous conclusions as to autosomal linkage of the genes for cerebral hernia, polydactyly, and dominant white plumage.

The behavior of a single gene in development.—Tests of a large number of birds and body areas indicate that the pattern of the regenerated feather depends on its location and on the previous developmental history of the follicle. The original pattern is restored at the molt and is followed again by variation during regeneration.

The effect of inbreeding on the bones of the fowl, L. C. Dunn (*Connecticut Storrs Sta. Bul. 152* (*1928*), *pp. 53–112*).—The results of a study of the measurements of the length of the cranium, femur, tibia, humerus, and ulna and breadth of the cranium, together with three proportions between these skeletal parts in about 600 inbred females and 350 outbred females from the experiments previously noted (E. S. R., 49, p. 575; 52, p. 772) show that successive generations of inbreeding resulted in a decrease in the length of the bone measurements. This decrease did not appear to be the result of a prolonged period of growth or delayed maturity. The decrease in all measurements was proportional. Thus, family differences appeared in the mean bone lengths, though these decreased in successive generations, but the ratio of one measurement to another, namely, cranial breadth to cranial length, femur length to tibia length, and ulna length to humerus length, became established in particular families and varied little in successive generations. The variability in the measurements among inbreds was less than in outbred stocks. In the two crosses of inbred families the F_1s of one cross had longer bones than were found in either parent, but in the other cross the F_1 measurements were intermediate.

An American "Dexter monster," W. G. Downs, jr. (*Anat. Rec., 37* (*1928*), *No. 4, pp. 365–372, figs. 4*).—An abnormal calf of the bulldog type, sired by a Holstein bull and from a Holstein-Jersey cow, is described. The long bones were short and thick, and the general conformation was short and stubby. The skull was unusually thick, and the thyroids were abnormal but functioning.

Quantitative studies of the testis.—III, A numerical treatment of the development of the pig testis, K. F. Bascom and H. L. Osterud (*Anat. Rec., 37* (*1927*), *No. 1, pp. 63–82, figs. 5*).—In continuation of the studies reported in part 1 (E. S. R, 54, p. 826) and part 2[1] of this series, determinations on 87 fetal pigs, ranging in crown-rump length from 6.6 cm. to 25.3 cm. and in body weight from 9.5 gm. to 793 gm., were made of the crown-rump length, body weight, fresh weight of testes, mean equatorial diameters of testes, average thickness of tunica albuginea, average diameter of the sex cords, and total length of the sex cords, with the computation of the percentage of the different portions of the testes.

From these data it was concluded that there is a sudden acceleration in the rate of growth of the testis at about the 20-cm. crown-rump length. The rates of growth of the mediastinum, tunica albuginea, and sex cords were approximately equal, although the interstitial tissue grew considerably more rapidly after the 20-cm. stage and up to at least 4 weeks after birth. From the 9-cm. crown-rump length up to 4 weeks after birth the total length of the sex cords increased about 100 times, though the diameter was practically constant. Acceleration of testis growth was found to occur coincidentally with the descent of the testis through the inguinal ring and probably with the appearance of the hormone of the anterior lobe of the hypophysis.

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[1] Quantitative Studies of the Testicle.—II, Pattern and Total Tubule Length in the Testicles of Certain Common Mammals, K. F. Bascom and H. L. Osterud. Anat. Rec., 31 (1925), No. 2, pp. 159–169.

The cyclical growth of the vesicula seminalis in birds is hormone controlled, O. RIDDLE (*Anat. Rec., 37 (1927), No. 1, pp. 1–11, figs. 6*).—Evidence of manifold enlargement of the vesiculae seminales of feral birds without the presence of sperm is presented. The weight of the vesiculae of some species in the breeding period is more than 100 times greater than the weight of these organs in winter. The growth of antlers in deer is the only case to exceed the rate of growth of the vesiculae prior to the breeding season.

The origin of the definitive ova in the white rat (Mus norvegicus albinus), E. O. BUTCHER (*Anat. Rec., 37 (1927), No. 1, pp. 13–29, figs. 10*).—From a histological study of a series of ovaries from rats ranging from birth to old adult females, it was concluded that the germ cells in the ovary at birth degenerate before sexual maturity and that the definitive ova are formed from the cells of the germinal epithelium covering the ovary. While the formation of new definitive ova is retarded after puberty, there is an increase in the activation of the epithelium during oestrum. No synapsis was observed during the process of transition of germinal epithelial cells into germ cells.

An unfertilized tubal ovum from Macacus rhesus, E. ALLEN (*Anat. Rec., 37 (1928), No. 4, pp. 351–356, fig. 1*).—An ovum recovered from the tube of a monkey is described. The average diameter of the zona pellucida was 178.5 μ and of the ovum proper 104 μ. Study of the fresh ovum in Ringer's solution showed a fluid zone between the zona pellucida and the yellow cytoplasm in which the ovum moved freely. The rolling of the ovum revealed a cap of lighter clear protoplasm about one-third the size of the egg, which remained on top when the ovum was in a stationary position.

Twin heterosexual pig embryos (32 mm.) found within fused membranes, L. HOADLEY (*Anat. Rec., 38 (1928), No. 2, pp. 177–187, figs. 8*).—The fusion of the membranes of two heterosexual pig embryos is described, as well as evidence at the 32-mm. stage of a definite influence of the male hormone circulating in the fused blood stream of the two membranes on the histological structure of the developing gonads in the female embryo.

Effect of bilateral ovariectomy upon the duration of pregnancy in mice, R. G. HARRIS (*Anat. Rec., 37 (1927), No. 1, pp. 83–93*).—In experiments with mice it was found that bilateral ovariotomy, whether in one or two operations at intervals of several days, terminated pregnancy. Previous to the fifteenth or sixteenth day of pregnancy the operation resulted in death and subsequent resorption of the embryos, but after this stage pregnancy terminated in abortion. In control experiments exposure and the manipulation of the ovaries or uterus during pregnancy and unilateral ovariotomy did not interfere with pregnancy.

Seasonal variations in fertility and in the sex ratio of mammals, with special reference to the rat, H. D. KING (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 112 (1927), pp. 61–111, figs. 9; Ger. abs., pp. 107–109*).—From a study of the seasonal variations in fertility and sex ratio among 16,487 litters of rats produced in the Wistar Institute colony and analyses of birth records of man, mice, pigs, and dogs, the author found that the highest fertility in all the lower animals was for conceptions occurring in the spring or summer, with the lowest fertility in the autumn or winter. In the rat the average size of the litters cast was fairly constant throughout the year, but in the other animals the number of litters and size of litters were greater and the sex ratio higher during the first six months than during the second six months of the year. The different sources of data were somewhat conflicting for man.

The combined results indicated a greater number of conceptions in the first half of the year, with a higher sex ratio for conceptions in the second half. The sex ratio in the rat closely approximated equality, with slight variations which showed a greater tendency toward a yearly cycle than toward a seasonal cycle, reaching its highest point in conceptions occurring in the spring and summer and its lowest point in autumn and winter conceptions. In the mouse, pig, and dog the sex ratio is high for conceptions in the autumn. The rat data indicated that months of low productivity were also those in which low sex ratios occurred.

The effect of the rise and fall of temperature on body metabolism is considered as the underlying cause for seasonal changes in the sexual cycle of lower mammals, and the variations in the sex ratio at birth in the rat are assumed to be due chiefly to variations in the primary sex ratio. It is suggested that sex is not determined by a purely chance meeting of the ova and sperm, but that the changes in body metabolism influence the ova and render them more readily fertilized by one kind of sperm than by the other.

Further investigations of the influence of the thyroid and thymus on the development of feathers in chickens [trans. title], J. Křížĕnecký and M. Nevalonnyj (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 112 (1927), pp. 594–639, figs. 26*).—The results of numerous studies showed that thyroid feeding hastened feathering and the change from down to feathers in chicks, though the breeds differed in the degree to which this effect was exhibited as did individual birds. Thyroid feeding also broke down the intensity of the pigmentation, especially in the basal part of the feather, modified the structure and shape of the feather by increasing the size of the basal part, and made the shape and pigmentation of the feathers of males more like those of females.

On the other hand, thymus feeding had a definite influence on the feathers and pigmentation of chicks and it arrested feather development, but this influence was weaker than the stimulating influence of the thyroid. There also appeared to be an antagonism between the action of thyroid and thymus on pigmentation, the latter tending to intensify pigmentation. The thymus, however, had no influence on the form of the feathers or the tendency toward the intersexual characteristics which were brought about by the thyroid.

The influence of hyperthyroidism and hyperthymusism on maturity, growth, and pigmentation of the feathers of mature fowls [trans. title], J. Křížĕnecký and J. Podhradský (*Ztschr. Wiss. Biol., Abt. D, Arch. Entwickl. Mech. Organ., 112 (1927), pp. 577–593, figs. 6*).—Studies of the effect of feeding dry thyroid and thymus to fowls showed that thymus feeding had no influence on the molting or pigmentation of the feathers. On the other hand, thyroid feeding induced molting, and if continued some of the new feathers were white. If the thyroid feeding was discontinued, the new feathers coming in were pigmented normally but they did not come in completely over the entire body.

FIELD CROPS

Crops and plant breeding, F. L. Engledow (In *Agricultural Research in 1927. London: Roy. Agr. Soc. England, 1928, pp. 1–37*).—Topics discussed in this review of recent research activities (E. S. R., 59, p. 221) include English cereal varieties, seed setting and heredity in the cabbage group, reversion and deterioration in plants, and grass mixtures.

[Agronomic studies at the Connecticut Storrs Station] (*Connecticut Storrs Sta. Bul. 150 (1928), pp. 5–9, figs. 2*).—Comparative tests wherein strains of Green Mountain, Irish Cobbler, and Russet Rural potatoes, grown in isolated rogued plats during several years at the station, outyielded certified strains of these varieties from other States although having higher percentages of plants infected with degenerative diseases, demonstrated that vigorous seed potatoes can be grown in Connecticut provided the percentages of degenerative diseases be kept reasonably low. Using seed of Green Mountain dug at three maturity stages, the diseases increased in the resulting crop and the yields decreased with the greater maturity of the seed.

Alfalfa receiving no treatment during 10 years except 200 lbs. of potassium chloride per acre every third year maintained good stands and yields. Alfalfa responded much better to potassium than to phosphorus, application of the latter seeming to encourage weed growth. It also gave a better response than red clover to potassium. Better stands and thriftier alfalfa were obtained where Hubam sweet clover rather than oats was the nurse crop.

Fertilizer treatments on pastures grazed by yearling steers and on crops in dairy farm rotations and cutting tests with alfalfa are noted briefly. Only tillable areas were found suitable for increasing pasturage with sweet clover.

Plants for intercrop pastures [trans. title], E. DOĬARENKO (DOJARENKO) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 5 (1928), No. 4, pp. 235–274, figs. 8; Eng. abs., pp. 273, 274*).—In elaborate studies to determine the merits of a number of forage grasses and legumes for temporary pastures in the rotation after grain harvest before planting potatoes and on fallow before plowing, data were recorded on growth, increase, aggressiveness, and durability. Plants outstanding in pasture value in the earlier phases of the work have included *Avena elatior*, *Dactylis glomerata*, *Festuca pratensis*, *F. arundinacea*, *Agrostis alba*, *Bromus arvensis*, *B. mollis*, *B. secalinus*, *Triticum caninum*, *Trifolium pratense*, and *Anthyllis vulneraria*.

The intensive treatment of grassland, LORD BLEDISLOE (*London: P. S. King & Son, 1928, pp. 32*).—A popular exposition of modern grassland management is presented, with brief accounts of experiments on the fertilizing of pasture and on grazing.

Alfalfa, J. F. COX and C. R. MEGEE (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. XI+101, pl. 1, figs. 43*).—Intended primarily for farmers and vocational students, this book gives practical information on the growing, management, and utilization of alfalfa for hay or seed.

Relation of plumpness and viability to color of Grimm alfalfa seed, J. C. AYRES (*Seed World, 25 (1929), No. 2, p. 17*).—In samples of Grimm alfalfa seed from southern Idaho the brown seed content averaged 13 per cent and the green seed 11.5 per cent. Fewer shriveled brown than green seed were found. The brown seed contained less hard seed, produced more abnormal sprouts and the more vigorous normal sprouts, and showed more rot than the green seed.

The characteristics of alfalfa (Medicago sativa) seed from Turkestan [trans. title], N. KOULECHOFF (*Compt. Rend. Assoc. Internatl. Essais Semences (Proc. Internatl. Seed Testing Assoc.), 1928, No. 3, pp. 5–17; Eng. abs., p. 16; Ger. abs., p. 17*).—The name "Turkestan alfalfa" as characterizing a uniform variety is held incorrect, since alfalfa seed samples from various localities in Turkestan differ decidedly in qualities and in content of characteristic foreign matter.

Field experiments with alfalfa in 1925–1926 [trans. title], N. N. Balashev (*Trudy Uzbek. Selsk. Khoz. Opytn. Sta., No. 4 (1928), pp. 39–77, figs. 9*).—Alfalfa responded favorably to superphosphate (acid phosphate) on the gray soils of Turkestan. Applications at the rate of 100 lbs. of phosphoric acid per acre were most effective and were profitable, the effect lasting well into the second year, whereas a repeated application did not result in a yield increase. The increase in alfalfa yields was accompanied by a decrease in weeds. Spring application of fertilizers gave better results than an application after cuttings. Disking surpassed harrowing, although either practice in the spring was better than when done after cutting. A cover crop of wheat did not favor the alfalfa. Its depressing effects were observed also on the next year's crop, but as the alfalfa developed the depression due to the cover crop disappeared.

The effects of early planting on the composition and yield of corn, B. A. Brown (*Connecticut Storrs Sta. Bul. 151 (1928), pp. 37–51, figs. 4*).—When planted about the average date of the last killing frost (May 3), 3 weeks before the usual planting date, several corn varieties averaged 759 lbs., or about 10 per cent, more dry matter per acre than from May 27 planting. Eureka was the only variety giving significant increases in green silage from the early planting, indicating that most of the increase in weight of dry matter was due to greater maturity at harvest. In 1924 the very cool spring retarded the early planted corn so that no advantage was derived from the practice that year. A comparison of the grain yields of three varieties showed the increase from early planted corn to be 4.8 per cent in total yield and 3.9 per cent in the quantity of hard corn. The general results suggested that corn might be planted earlier profitably in Connecticut.

A study of the locular composition in Cambodia cotton, V. R. Ayyar (*Agr. Research Inst., Pusa, Bul. 178 (1928), pp.* [2]+*20, pls. 3*).—In observations on two strains of *Gossypium hirsutum* and on a strain from *G. hirsutum*×*G. purpurescens*, seasonal fluctuation was noted in the stigmatic composition of the flowers produced on the same plant, 5-locked bolls being generally produced early in the season. The number of 5-locked bolls and the number of the remainder of the bolls produced by a plant were correlated positively, and the regression lines were linear. The number of ovules per lock was highest in a 3-locked boll and least in a 5-locked, whereas the reverse held true for number of ovules per boll. The variation in number of ovules was least in 4-locked bolls and highest in 5-locked bolls. When the number of ovules per lock increased there seemed to be a proportionate and absolute increase in the number of seeds set. With the number of ovules kept constant the relationship between fecundity and locular composition varied with the strain. The weight of seed cotton per seed was least in a 5-locked boll and highest in a 3-locked boll.

Cotton production among the negroes, C. Monteil (*État Actuel de Nos Connaissances sur l'Afrique Occidentale Française.—IV, Le Coton Chez les Noirs. Paris: Com. Études Hist. et Sci. Afrique Occident. Franç., 1927, pp. 100, pls. 3, fig. 1*).—An account of the development and present status of cotton growing and the utilization of the crop by the natives of French West Africa. Information is given on producing districts, varieties, cultural practices, and the preparation of cotton fabrics.

The British Cotton Growing Association: Twenty-third annual report for the twelve months ending December 31, 1927 (*Brit. Cotton Growing Assoc. [Pub.] 101 (1928), pp. 61, pls. 10*).—This report describes the activities of the association (E. S. R., 58, p. 634) during 1927 and gives summary accounts of cotton production in the British colonies and possessions.

Correlations between some quantitative characters in flax [trans. title], N. D. Matveev (Matweew) (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *5*

(1928), No. 2, pp. 94–105, fig. 1; Ger. abs., pp. 104, 105).—An extensive list of correlation coefficients is tabulated from studies on important stem, fiber, and seed characters of flax grown in 1925 and 1926. Both slight and extreme variations were noted in the coefficient of pairs of characters. Variations in this regard seemed due to both genetic and environmental causes. The striking variations in correlation appeared in most cases to preclude the use of certain characters as indirect criteria in selection work.

Effect of the age of pollen upon the sex of hemp, E. A. BESSEY (*Amer. Jour. Bot., 15 (1928), No. 7, pp. 405–411*).—When female flowers of hemp were artificially pollinated at the Michigan State College at different times in the day with pollen ranging in age from fresh to 64 hours old, the sex ratio, as revealed by seeds planted the next year, was not significantly different whether the pollen used was fresh or collected hours before.

Studies in the jowars of Gujarat.—I, The jowars of the Surat District, M. L. and G. B. PATEL (*India Dept. Agr. Mem., Bot. Ser., 16 (1928), No. 1, pp. [3]+57, pls. 6, fig. 1*).—Important varieties and pure strains of jowar (sorghum) cultivated in Surat are described as to agronomic and botanical characters, yield, and variability. Detailed treatment is accorded the botanical characteristics of the plant, including stem and leaves, inflorescence and blooming, and the head; natural cross-fertilization; and the heritable nature of 10 agronomic characters.

Potatoes, W. J. SQUIRRELL and A. H. MACLENNAN (*Ontario Dept. Agr. Bul. 339 (1928), pp. 23, figs. 9*).—The climatic, soil, fertility, and cultural requirements of potatoes are described from extensive investigations at the Ontario Agricultural college, and information is given on harvesting, storage, marketing, and seed certification.

The Green Mountain, Rural New Yorker, and Irish Cobbler varieties have been of the greatest economic importance in Ontario, with Green Mountain leading in test yields. Experiments showed that where season and labor conditions permit, larger acre yields would be obtained if the main crop potatoes were planted somewhat earlier than the usual May 15 to June 1. The best table quality came from the earliest plantings when the tubers were mature at harvest.

Where seed potatoes were variously exposed to light and heat late in May for 3 weeks before planting, late potatoes kept on the barn floor and planted whole with short sprouts attached surpassed seed tubers submitted to other exposures in total yield and in marketable potatoes. Tubers kept in a dark root cellar and carefully planted with sprouts attached averaged 28.7 bu. more per acre than similar potatoes with sprouts removed. Tubers exposed to open air were injured considerably by temperature changes.

Both total and marketable yields rose consistently with increase in the size of one-eyed sets from $\frac{1}{16}$ to 2 oz. As the number of eyes rose from 1 to 5 in 1-oz. potato sets, there was usually a decrease in the size of the largest tubers and in marketability and an increase in the average total acre yield. Sets placed with eyes downward and sets with eyes upward gave like average acre yields. One-eyed sets from the middle part of the tuber generally outyielded those from either end and made a more marketable crop. Tubers planted the same day cut outyielded those planted 4 or 5 days after cutting. Freshly cut tubers coated with land plaster surpassed limed and untreated seed in order. Ground brick and road dust were also effective for this purpose. All factors considered, from 3- to 5-in. depths appeared desirable on the clay loam soil, with rows from 30 to 33 in. apart and sets dropped from 10 to 14 in. apart. In cool, rather wet seasons results favored hill culture, while in hot dry summers level culture did best.

Yield and plant population in sugar beet, F. L. ENGLEDOW, C. A. MAHER, J. H. SMITH, H. R. WILLIAMS, H. FAIL, and F. RAYNS (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 4, pp. 574–601, figs. 3*).—In spacing experiments with sugar beets in Cambridgeshire, Hertfordshire, and Norfolk seedlings of various frequencies per foot of row were singled to 10 in. apart. The technique is given in detail.

From irregularities in the seedling population, cost and success of singling seemed to be largely determined by germination of seed and mechanical efficiency of the drill. Limited data suggested that the fluctuations in sugar content arising from variations of interplant spacing in any one field were not of agricultural significance. In every field root size steadily decreased with increase in population density, which ranged in value from 0 to 6 or more plants per 4 ft. of row. The average yield per acre from unit lengths of row was closely related to density of population. One plant per 10 in. of row seemed ideal for English conditions. On all the fields monetary return was significantly limited by defects in population density, these largely originating in the seed and the seed drill.

Experiments in the cultivation of the sugar beet crop in the west midlands during 1927, W. M. DAVIES (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 4, pp. 628–633, fig. 1*).—Cultural experiments by the Harper Adams Agricultural College demonstrated that subsoiling was not needed where the soil did not tend to form hard lower layers, although deep cultivation is essential. Ridge culture disinctly surpassed flat culture in acre yields and money returns. Narrow rows did best, the 18-in. spacing seeming most practical for high yields. The width of hoe was less important than row width, a medium width hoe (from 6 to 8 in.) being favored. A marked relation was observed between tons per acre, gross returns, and relative net profits.

Certain acid soils and growth of sugar beet, G. NEWLANDS (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 4, pp. 704–712*).—Certain soils from northeast Scotland were examined to determine the causes of variation in the growth of sugar beets. Field conditions and mechanical composition did not account for the variations.

A certain degree of correlation was noted between pH value, readily extractable calcium, and beet growth. In general when the pH was below 5.3 and extractable calcium below 0.12 per cent growth was poor or failed, whereas above these figures it was good, but only relatively so, since all the soils were below pH 6.2. Comparing soils of equal extractable calcium content, that with higher humus content had the higher lime requirement. In an examination of two samples from areas of poor beet growth and two from areas of better growth, but all from one soil type, the results for pH value, lime requirement, exchangeable calcium, titratable acidity, and degree of saturation all correlated well with each other and with beet growth.

Varietal tests of Russian sugar beets in America during 1927, G. STEWART (*New York; Amtorg Trading Corp., 1928, pp. 39, figs. 12*).—Varietal trials in 22 localities in the United States and Canada in 1927 showed that Russian sugar beet seed produced good stands and in general made good yields, with satisfactory purity and sugar contents.

Sugar cane and its culture, F. S. EARLE (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. VII+355, figs. 24*).—Designed for both the practical field man and the sugar cane technologist, this volume in part 1 treats of the history, propagation, botany, and varieties of sugar cane, and of diseases, insects, and other pests of the crop. Part 2 is concerned with climate, soils, and cultural methods. An annotated list of sugar cane varieties

(E. S. R., 46, p. 835) and brief statements of the status of the cane sugar industry in important producing countries are appended.

Sugar cane varieties in Cuba, F. S. EARLE (*Planter and Sugar Manfr., 81 (1928), Nos. 19, pp. 361, 362; 20, pp. 383–385; 21, pp. 404, 405; 22, pp. 424, 425, 439; 23, pp. 443–445, 459, 460; 24, pp. 462–464; 25, pp. 482–484*).—This paper records the results of extensive varietal studies and comparisons with sugar cane varieties, seedlings, and hybrids pertaining to important groups and tested in different localities in Cuba.

Denton wheat, a new variety for north Texas, A. H. LEIDIGH, P. C. MANGELSDORF, and P. B. DUNKLE (*Texas Sta. Bul. 388 (1928), pp. 20, figs. 4*).—Denton, a pure line selection from Mediterranean (soft red winter) wheat, developed at the Denton, Tex., Substation is described as a typical Mediterranean wheat in practically all characters except stem color, which is yellow rather than blue. According to the data recorded from the various tests, Denton has proved superior in yield, rust resistance, strength of straw, and baking quality to varieties commonly grown in north Texas and bids fair to replace extensively varieties currently grown in the region.

A study of variations of Marquis wheat in relation to different spacing of plants, G. E. DELONG (*Sci. Agr., 9 (1929), No. 5, pp. 282–300, figs. 10*).—Considering that Marquis 10 B, one of the purest strains of the variety available, varied widely in several important tiller and spike characters of which glume length was the most constant of those studied when planted in several spacings at Lacombe, Alta., the author holds that other strains of Marquis and other varieties of wheat may also be subject to extreme variations in morphological characters when grown under varying conditions of environment. It seemed essential that spikes of similar maturity and grown under similar environmental conditions should be selected for strain comparisons.

Studies on the root system of spring wheat [trans. title], M. N. KRAVTSOV (CRAVZOV) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 5 (1928), No. 2, pp. 80–93, figs. 3; Eng. abs., p. 93*).—According to the results of experiments reported, the primary root system of spring wheat under natural conditions remains vital until growth ceases, even penetrating deeper than 100 cm. (39 in.). It may also supply moisture during the ripening period when the upper soil layers are dry. In years of drought the crop is produced practically entirely through the activity of the primary roots. The secondary root system depends on the moisture in the upper layers for its appearance and development, being depressed by drought, and since it is later, is not so extensive as the primary system, developing a mat at about from 30 to 35 cm. deep. Early seeding in dry regions secures a normally developed secondary root system, whereas delayed seeding reacts unfavorably and with reduced yields. The root system is considered an additional criterion for the selection of varieties for dry conditions.

Difference in length of vegetative period in winter and spring wheat and rye [trans. title], P. E. GREBENNIKOV (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 5 (1928), No. 9, pp. 632–637; Eng. abs., p. 637*).—Comparative plantings of winter and spring varieties of *Triticum vulgare, T. durum, T. turgidum,* and rye showed that spring-sown winter wheat and rye did not produce spikes the following summer, whereas the heading of spring-sown spring wheat and rye took place characteristically in different periods. Sown at the same time as winter crops, spring and winter wheat and rye all headed the next summer. The heading periods differed among groups and varieties and not as to spring or winter habit, each group comprising early and late races. Winter and spring wheat and rye sown late in the fall did not differ much in length of vegetative period.

The use of ultraviolet rays in judging grain, J. Tausz and H. Rumm, trans. by A. Kemeny (*Northwest. Miller, 157 (1929), No. 2, p. 144*).—When examined under ultra-violet light, kernels of corn appeared light purplish blue, barley pale green, oats pale blue, and wheat blue. The colors were particularly noticeable on those parts of the grain where the bran coat was thin. Of the principal constituents of wheat kernels, starch was blue to purplish blue and gliadin and glutenin blue to bluish green in color.

Wheat kernels with intensive green fluorescence were always somewhat shriveled and smaller than the blue ones. Those exhibiting an intensive blue fluorescence usually were heavy, fully developed, and large, whereas the rest, pale blue and brownish berries, were mostly of medium size and quality. The kernels showing an intensive green fluorescence seemed to be those not fully ripe before the wheat was cut, such that they differed from ripe grain in chemical constitution. No differences were found either in the germination or in the moisture contents of kernels of green and of blue fluorescence. The number of kernels showing green fluorescence decreased with tests each month until after about 6 months when practically none were found.

Bateson's experiments on bolting in sugar beet and mangolds, A. D. Hall (*Jour. Genetics, 20 (1928), No. 2, pp. 219–231*).—Experiments by the late W. Bateson on the bolting of sugar beets and mangels are reported by the author.

Ordinary stocks of mangels, sugar beet, and garden beet are held to constitute mixed populations mainly biennial in habit but containing individuals which will bolt under ordinary conditions in the open. The proportion rises rapidly under conditions favoring bolting, e. g., early sowing. Sowing under glass at the beginning of the year and transplanting into the open about April induced about 70 per cent of the seedlings to bolt.

Selection of seed for two or three generations from plants not bolting under such forcing conditions brought forth strains of seed neither bolting in ordinary open plantings nor when forced. Differences of individuals in bolting tendency or in resistance to conditions encouraging bolting were shown to be genetic in origin and inherited. While high resistance v. low resistance to bolting did not seem to be a simple character, the evidence was insufficient for a definite factorial scheme. In leeks the tendency to bolt was only observed when early sowings were made in December or early January, whereas onions follow a different rhythm, bolting not being induced by early sowing. The experiments suggested that commercial stocks of seeds of mangels, sugar beet, or garden beet can easily be freed from strains susceptible to bolting under normal growth conditions.

Seed germination in certain New Mexico range grasses, C. V. Jackson (*Bot. Gaz., 86 (1928), No. 3, pp. 270–294, figs. 5*).—The results of germination tests with seed of a number of species of range grasses are tabulated. The annual rainfall, especially during growth and at harvest, seemed to affect the vitality of the seed. The rather impermeable seed coat in Sporobolus seed, excepting *S. airoides*, required puncture by scratching or pricking before good germination resulted, soaking or even shaking for 9 hours in sand having little effect.

The effect of high pressure on the percentages of soft and hard seeds of Medicago sativa and Melilotus alba, P. A. Davies (*Amer. Jour. Bot., 15 (1928), No. 7, pp. 433–436*).—Further experiments (E. S. R., 59, p. 228) are reported on the effects of pressures of 2,000 atmospheres at 18° ± 2° C. on the germination and hard and soft seed content of alfalfa and sweet clover.

Tests just after the pressures were applied showed the optimum duration for the lowest percentage of soft seed to be 1 minute for seeds of *M. sativa* and 10 minutes for seeds of *M. alba*. The most soft seed and the least hard seed occurred in the 10-minute exposure for *M. sativa* and in the 30-minute exposure for *M. alba*. In tests 30 days after pressure the lowest percentage of soft seed was found in the 2-minute exposure for *M. sativa* and in the 10-minute exposure for *M. alba*. The percentages of hard seed resembled those in tests just after the pressures were applied. Excepting the 1- and the 10-minute exposures for seeds of *M. sativa*, tests 6 months after pressure showed higher percentages of soft seed than in the 30-day tests. In every test the percentage of soft seed was higher and of hard seed lower than in the control.

A survey of weed seed impurities of agricultural seed produced in Canada, with special reference to the determination of origin, F. T. Wahlen (*Compt. Rend. Assoc. Internatl. Essais Semences (Proc. Internatl. Seed Testing Assoc.), 1928, No. 3, pp. 19–66, figs. 3; Fr. abs., pp. 61–63; Ger. abs., pp. 64–66*).—Tables show the relative constancy, dominancy, and frequency of the seeds of other cultivated plants and of weeds in samples of seed of red clover, alfalfa, sweet clover, timothy, brome grass, western ryegrass, oats, wheat, barley, and flax grown in different localities in Canada. Production districts are indicated, and characteristic weed seed impurities are pointed out.

HORTICULTURE

[Horticultural investigations at the Canadian experimental stations and farms] (*Canada Expt. Farms, Rpts. Supts. 1927, Agassiz (B. C.) Farm, pp. 21–24, 25–29, fig. 1; Beaverlodge (Alta.) Substa., pp. 36–52, figs. 4; Brandon (Man.) Farm, pp. 52–60, 61–64, figs. 3; Charlottetown (P. E. I.) Sta., pp. 23–35, 36–38, figs. 5; Fredericton (N. B.) Sta., pp. 25–31, 34, 35; Harrow (Ont.) Sta., pp. 27, 28, 29; Indian Head (Sask.) Farm, pp. 31–43, 45–50, figs. 2; Kapuskasing (Ont.) Sta., pp. 31–34, 35, 36, 37–40; Lennoxville (Que.) Sta., pp. 37–47, fig. 1; Morden (Man.) Sta., pp. 16–36, figs. 4; Rosthern (Sask.) Sta., pp. 24–29, 31–34; Scott (Sask.) Sta., pp. 31–37, 39–45; Swift Current (Sask.) Sta., pp. 26–31, 33–36, fig. 1; La Ferme (Que.) Sta. Rpt. Supt. 1926–1927, pp. 28–35, 38–40*).—Brief reports are again given (E. S. R., 58, p. 836) by W. H. Hicks, W. D. Albright, M. J. Tinline, J. A. Clark, C. F. Bailey, H. A. Freeman, W. H. Gibson, S. Ballantyne, J. A. McClary, W. R. Leslie, W. A. Munro, V. Matthews, J. G. Taggart, and P. Fortier, respectively, on the results of miscellaneous varietal and cultural studies with fruits, vegetables, and flowers.

[Horticultural investigations at the Invermere, B. C., Experimental Station, 1927], R. G. Newton (*Canada Expt. Farms, Invermere (B. C.) Sta. Rpt. Supt. 1927, pp. 18–22, 25–29, 30, fig. 1*).—In addition to brief reports on general horticultural work, mention is made of the results of plant breeding studies.

Three promising new varieties of garden peas, designated as Bruce, Director, and Kootenay, are recommended on account of high productivity and good quality. A dwarf pea obtained by crossing Lincoln and Arthur is recommended for the home garden.

[Horticultural investigations at the Sidney, B. C., Experimental Station, 1927], E. M. Straight (*Canada Expt. Farms, Sidney (B. C.) Sta. Rpt. Supt. 1927, pp. 12–29, 31–34, 35–38, figs. 7*).—The results of miscellaneous experiments with fruits, vegetables, flowers, and nuts are briefly presented.

Measurements of the effect of nitrate of soda, muriate of potash, and superphosphate (acid phosphate) used separately and in combination on the growth and yield of apple trees showed the nitrate used alone to be outstandingly effective. However, twice as much nitrate of soda was used alone as in the complete mixture. In the case of pears nitrate of soda was again the most effective fertilizer.

Observations on strawberry seedlings resulting from open pollination showed wide variation within the individual progenies.

Conforming with the results of Thompson (E. S. R., 55, p. 536) suckering of sweet corn reduced yields.

In rhubarb forcing, exposure of the roots to frost before storing increased yields and promoted earliness. Soil proved a better covering for roots than did straw.

In comparing paper and dust mulch in pea culture, somewhat larger yields were obtained with the paper.

[Horticultural investigations at the Summerland, B. C., Experimental Station, 1927], W. T. Hunter (*Canada Expt. Farms, Summerland (B. C.) Sta. Rpt. Supt. 1927, pp. 4–35, 36–41, fig. 1*).—The usual annual report (E. S. R., 58, p. 836).

In pomological studies, conducted by R. C. Palmer, it was observed that in red apples the development of red color was closely associated with maturing processes. In respect to size increment, it was noted that apples continued to increase at a comparatively uniform rate right up to the final picking. Data upon several varieties suggested that the ease of separating the fruit from the spur is an important index to picking maturity. Seasonal changes and varietal differences in hardness suggested that the pressure tester is not well adapted to general use. The browning of seeds was not and changes in ground color were valuable indexes to maturity. Water core, since it commonly developed in late picked fruit, had some value as a maturity index.

Shriveling in storage was observed to vary with varieties and to be reduced by late picking. For fruit in common storage late picking favored long keeping. The pressure test proved valuable for recording changes in stored fruit. Varieties differed markedly in resistance to scald and breakdown. Concerning breakdown, the stage of maturity at which the apples were picked was an important factor in control, late picked fruit being particularly susceptible. The color chart proved an effective help in determining the time to harvest apples.

In a general report by W. M. Fleming on vegetable and flower growing activities, there are included the results of a study of the influence of soil temperature upon cantaloupe planting in which it was found that a soil temperature of 50° F. at a depth of 2 ft. was the optimum for planting this crop. The beneficial influence of plant protectors was evidenced in higher yields of cantaloupes from the protected plants, both those transplanted and those sown in situ.

[Horticultural investigations at the Kentville, N. S., Experimental Station, 1927], W. S. Blair (*Canada Expt. Farms, Kentville (N. S.) Sta. Rpt. Supt. 1927, pp. 11–28, fig. 1*).—Experimental work with various fruits, vegetables, and flowers is again discussed (E. S. R., 58, p. 837).

Nitrate of soda, 100 lbs. per acre, applied broadcast to strawberries after the start of growth materially increased yields. Larger applications were not profitable. The same sized application of nitrate of soda as an autumn top-dressing gave consistent increases in yield. Comparing nitrate of soda and cyanamide as autumn top-dressings, the former was found more effective in stimulating fruit bud formation.

Observations on the results of fertilizing red raspberries in the fall and spring with nitrate of soda and cyanamide showed the fall to be the better season for applying cyanamide and spring for nitrate of soda. Data on Burbank and Giant Prune trees grown from different sized nursery stock showed no material differences at the end of 14 years.

Vegetable gardening in Alaska, C. C. Georgeson (*Alaska Stas. Bul. 7 (1928), pp. 32, figs. 5*).—Briefly describing the climate and soil conditions under which vegetables are grown in Alaska, the author outlines various cultural practices which have proved successful, describes the construction of hotbeds and coldframes, and discusses the testing of seeds and the culture of the various vegetables that may be grown. The vegetables are divided into three general groups according to their adaptability to Alaskan conditions.

Cold storage investigations with fruits and vegetables, II [trans. title], R. Plank and E. Schneider (*Beihefte Ztschr. Gesam. Kälte-Indus., 3 (1928), No. 3, pp. 47, figs. 26*).—Supplementing an earlier report by the senior author (E. S. R., 58, p. 535), further information is presented on the most favorable temperature, relative humidity, air movement, and average length of storage life for various fruits and vegetables, including varieties of the cherry, gooseberry, apricot, plum, prune, pear, pea, snap bean, cucumber, lettuce, and tomato.

Fruit Breeding Farm, F. E. Haralson and A. N. Wilcox (*Minn. Hort., 57 (1929), No. 1, pp. 7–13*).—This report presented in two parts, (A) General Report, by Haralson, and (B) Report on the Scientific Work, by Wilcox, covers the 1928 activities.

Under part B are reported the results of a survey of apple and plum seedlings at the station, in which it was found that most of the crosses were represented by only a relatively few individuals, too few in many cases to justify drawing conclusions as to the value of the parental cross. Several varieties of strawberries possessing desirable characteristics were self-pollinated in an attempt to develop pure lines for future recombination. Mention is made of a quick method devised by J. H. Beaumont and A. C. Hildreth for determining the hardiness of apple trees by a simple examination of the twigs and buds.

The behaviour of certain pears on various quince rootstocks, R. G. Hatton (*Jour. Pomol. and Hort Sci., 7 (1928), No. 3, pp. 216–233, pls. 3, fig. 1*).—That the type of quince root employed in propagation of pears may exert a profound influence on the scion was indicated in studies at the East Malling Research Station, England. Of seven types of stocks designated A, B, C, D, E, F, and G, only three, A, B, and C, were found of general commercial value, the others showing marked incompatibilities with many of the pear varieties used in the study. Certain pear varieties manifested distinct preferences for particular quince stocks, occasionally even for the types proving generally unsatisfactory. A study of the root systems of the various stocks when budded to pear showed more vigorous development in the case of A, B, and C. Comparing the growth and the fruiting of pears on A, B, and C roots it was found that trees on C made the strongest early growth and were first to bear fruit. At the same time quince C, growing on its own roots, was typically dwarf and unproductive, while comparable trees of the less favored and rejected stocks grew vigorously and fruited freely.

Plums and prunes on various stocks, W. W. Cooke (*Agr. Gaz. N. S. Wales, 39 (1928), No. 11, pp. 854–856*).—Records taken in 1927 at the Yanco Experiment Farm, New South Wales, on the yield and grade of dried Robe de Sergeant and Agen prunes obtained from trees budded on Myrobolan, Marianna, apricot, and peach roots showed the maximum yields in one variety on apricot and in the other on peach roots. Marianna was not found a satisfactory rootstock for plums or prunes under irrigation. Measurements of height, spread, and trunk girth showed the maximum development on apricot and peach roots.

Fertilization of the grape [trans. title], C. Dusserre (*Ann. Agr. Suisse, 28 (1927), No. 1, pp. 73, 74*).—In experiments conducted at Jussy, near Geneva, by the Federal Institute of Agricultural Chemistry of Lausanne, barnyard manure alone gave practically the same yields of grapes as did one-half the manure supplemented with chemicals. Sugar and acid contents were nearly alike in both cases. In another test at Pully the absence of potassium reduced yields, increased the sugars, and reduced acidity. Nitrate of soda, as compared with no nitrogen and with cyanamide, increased yields but had little effect on sugars or acids.

The best oranges of the Far East, T. TANAKA (*Jour. Heredity, 20 (1929), No. 1, pp. 36–45, figs. 5*).—An account of the Ponkan, Tankan, Kosho-Tankan and Haili oranges from Taiwan (Formosa) and the adjacent Chinese coast.

Further evidence of the direct effect of pollen on the fruit of the date palm, R. W. NIXON (*Date Grower's Inst. Rpt., 4 (1927), pp. 7–9*).—Continuing earlier studies (E. S. R., 59, p. 43), "Mosque" pollen which produced large fruit and seed of late maturity was compared with Fard No. 4 pollen which produced small fruit and seed ripening early. In many instances the pollens were applied to different strands of the same flower cluster. The invariably consistent differences obtained confirmed the earlier finding that pollen has a direct influence in the date. In nine tests at Indio, Mosque pollen produced dates the dried flesh of which averaged 16.4 per cent heavier than that of comparable dates pollinated with Fard No. 4.

In a test of over 20 males 3 appeared comparable to Mosque and 5 to Fard No. 4, indicating a wide variation in males. No consistent differences in the fruit as regards texture and flavor were noted as a result of pollination.

Sugar analyses made by A. F. Sievers did not indicate any significant differences in sugar content that could be correlated with pollen. Abnormal seed appeared more frequently with certain pollens. The technique of experimental date pollination is discussed.

Chemical studies of dates, M. T. FATTAH (*Date Grower's Inst. Rpt., 4 (1927), pp. 10–12*).—In studies at the University of California with 24 lots of dates representing 14 varieties, there were found wide varietal differences in composition. In general, ripening involved a decrease in sucrose and tannin and an increase in reducing sugars. No correlation was recorded between the sucrose or total sugar content and sweetness. Of various means of hastening the ripening of immature dates, heat and carbon dioxide appeared most practical as measured in a fancy and wholesome product.

Experiments in storage of Deglet Noor dates, W. R. BARGER and A. F. SIEVERS (*Date Grower's Inst. Rpt., 4 (1927), pp. 9, 10*).—Dividing dates into groups according to maturity when harvested, it was found that slightly immature fruits September harvested and with a moisture content below 25 per cent could be held for 4 months without loss of flavor or color and with practically no increase in reducing sugars. At the same time comparable lots of fully ripe dates showed considerable increase in reducing sugars, became dark in color, and formed considerable sirup. Little difference was noted between 32° and 40° storage. Late October and November fruits of both stages of maturity kept in good condition for 4 months. The inferior keeping quality of early harvested, fully ripe dates is deemed to be associated with their high content of reducing sugars.

Unfruitfulness of the pecan, J. G. and N. C. WOODROOF and J. E. BAILEY (*Georgia Sta. Bul. 148 (1928), pp. 40, figs. 14*).—Declaring that unfruitfulness in the pecan may be traced to three causes, (1) failure to produce pistillate blooms, (2) dropping of immature nuts, and (3) failure of kernel to develop properly, the authors describe the second cause as of greatest import. Records taken in the station orchard in 1926 showed an average loss of 46.9 per cent of the potential crop in the first drop alone. Following years of excessive production instances were noted where all the pistillate blooms abscised prior to pollination. Studies indicated that it was impossible by improved management to reduce dropping previous to pollination but it was possible to increase the number of flowers per cluster.

A constant dropping of nuts ranging from 2 to 10 per cent per month was recorded from pollination to harvesting, reaching a peak in early May. Microscopic studies indicated that the May drop, which occurred just prior to or coincidentally with actual fertilization, was associated with unfertilized ovules. It is suggested that the May drop may be reduced by interplanting with proper pollinizers.

A third distinct dropping occurred in summer and is held due to various factors, notably insect injury, abortion of the embryo. scab, drought, etc. The anatomical structure of the abscission layer is discussed.

Based on a single year's records with eight varieties, it was found that very short twigs, 4 in. or less, often dropped all of their nuts. Above 4 in. only a relatively small percentage became completely unfruitful. In respect to the effect of the size of cluster, the records were inconsistent from year to year. In respect to position on the cluster, distinct differences were recorded. In a test of the effect of manure and fertilizers on dropping little variation was recorded in the case of three varieties between fertilizer treatments, varieties, or clusters, and led to the suggestion that even under favorable conditions one-half of the pollinated flowers may drop. Differences were noted in the capacity of different varieties to fill out properly. Dry weather, frost, insect injury, scab, mildew, soil poverty, and lack of culture were causes of poor filling. Notes are given on varieties, distances of planting, climatic adaptation, and cultural practices.

The reaction of the medium in relation to root formation in Coleus, E. P. Smith (*Bot. Soc. Edinb. Trans. and Proc., 30 (1927–28), pt. 1, pp. 53–58*).—At the Royal Botanic Garden, Edinburgh, stem cuttings of *C. blumei* placed in water cultures of various pH values rooted most readily in a pH 6.5 medium. The condition of the reserve foods in the cutting had a marked influence on rooting. Cuttings taken from plants grown in full sunlight and with high starch content rooted more readily and more profusely than others from plants in darkness whose chief reserves were reducing sugars. However, the relative effects of the different pH values were independent of carbohydrates.

The lilac, S. D. McKelvey (*New York: Macmillan Co., 1928, pp. XVI+581, pls. 176*).—This is a comprehensive study of the lilac genus, conducted principally in the Arnold Arboretum but supplemented by observations at various points in America and Europe. The sections on history and distribution, description of the genus and its sections with a key to the species, culture, and diseases and insect pests were prepared, respectively, by E. H. Wilson, A. Rehder, T. A. Havemeyer, and W. T. Councilman.

The yellow day lilies, B. Y. Morrison (*U. S. Dept. Agr. Circ. 42 (1928), pp. 14, figs. 4*).—Extolled as possessing the valuable qualities of permanence, tolerance to varied cultural conditions, long flowering season, and beauty, the day lily is discussed in relation to propagation, breeding, species and varieties, culture, and use with other plants.

Garden guide, edited by A. T. De La Mare (*New York: A. T. De La Mare Co., 1928, 5. ed., rev., pp. 380, figs. 274*).—A handbook (E. S. R., 39, p. 245) for the amateur gardener, presenting in a concise, practical manner information on the various details in the development and maintenance of a garden.

City and suburban gardening, C. C. Sherlock (*New York: A. T. De La Mare Co., pp. X+186, pl. 1, figs. 75*).—A popular discussion upon planning, planting, plant materials, and culture.

The unconventional garden, A. F. Hort (*London: Edward Arnold & Co., 1928, pp. VIII+280*).—A general discussion in which the principal stress is laid on the description and behavior of various unusual and new plant materials.

FORESTRY

The development of governmental forest control in the United States, J. Cameron (*Baltimore: Johns Hopkins Press, 1928, pp. IX+471*).—Tracing the development of the forestry situation in the United States from the days of apparently inexhaustible resources to the serious predicament now existing, the author points out the present-day need of more effective governmental control to save the residual forests and help restore the cut-over areas.

Measuring forest-fire danger in northern Idaho, H. T. Gisborne (*U. S. Dept. Agr., Misc. Pub. 29 (1928), pp. 64, pls. 5, figs. 14*).—A general discussion upon the use of moisture content determinations of the duff or forest litter as an index to fire hazards in the western white pine forests of northern Idaho.

Briefly reviewing the results of earlier investigations and discussing the physics of combustion as applied to the forest, the author reports the results of actual tests with duffs of different moisture content. From these he establishes six zones of inflammability, ranging from the noninflammable with a moisture content of over 25 per cent to the extremely inflammable with a moisture content of from 7 to 0 per cent. Precipitation was the only weather element capable of rendering duff noninflammable during the forest fire season. The distribution as well as the amount of rainfall was important. Relative humidity was also concerned with inflammability, the hazard decreasing and increasing, respectively, with high and low relative humidity. Air temperature, wind velocity, and the rate of evaporation were important in their influence on the moisture content of the duff and in the case of wind on the spread of fire. Protection of the duff by shade retarded drying and suggested the value of light cuttings.

The desirability of comparable studies with various forest fuels besides duff is emphasized, and a description of the duff hygrometer is appended, with notes on its use.

The structure of softwoods as revealed by dynamic physical methods, A. J. Stamm (In *Colloid Symposium Monograph*, [*VI*], edited by H. B. Weiser. *New York: Chem. Catalog Co., 1928, vol. 6, pp. 83–108, figs. 6*).—Four distinct methods of studying the anatomy of softwoods, (1) electroendosmotic flow, (2) hydrostatic flow with the application of Poiseuille's law, (3) the overcoming of the surface tension of liquids in wood capillaries by means of gas pressure, and (4) the permeability of the sections to colloidal solutions containing particles of known size, were utilized in this study.

DISEASES OF PLANTS

Studies in the physiology of parasitism.—X, On the entrance of parasitic fungi into the host plant, W. Brown and C. C. Harvey (*Ann. Bot.* [*London*], *41 (1927), No. 164, pp. 643–662, fig. 1*).—This is said to be a completed statement of work previously in part reported upon as in progress (E. S. R., 56, p. 843).

The authors state that membranes of paraffin wax, impermeable to one of the simplest electrolytes, were readily penetrated by germ tubes of *Botrytis cinerea* provided sufficient nutrient was available to the spores to allow of good germination. Penetration in this case could not have been determined by any chemotropic influence acting across the membrane. Membranes of formalized gelatin, within limits of hardness, were likewise penetrated. These membranes are highly permeable to crystalloidal substances. Penetration by the fungus hyphae was independent of the original distribution of the nutrient material. Membranes prepared from the epidermis of Allium scales and of Eucharis leaf were readily penetrated. The removal by thorough washing of any possible chemotropic substances present in the epidermal cells did not affect penetration, which occurred from the inner surface as readily as from the outer surface of these membranes.

Experiments with a series of membranes of formalized gelatin, the hardness of which can be varied, showed different fungi to possess different intrinsic powers of penetration, so that by the use of such a series a rough standardization of the penetrative power of different fungi can be attained. Germ tubes of *B. cinerea* fail to penetrate the epidermis of *Eucharis* spp. and of certain other plants so long as the underlying leaf tissue is turgid, though when such turgidity is absent, due to plasmolysis or killing, the epidermis is readily penetrated.

In the discussion which is given it is claimed that the only satisfactory theory of membrane penetration by fungi is that the stimulus to penetration is one of contact, and that the means of penetration is purely mechanical.

Virulence, serological, and other physiological studies of Bacterium flaccumfaciens, Bact. phaseoli, and Bact. phaseoli sojense, C. G. Sharp (*Bot. Gaz., 83 (1927), No. 2, pp. 113–144, pl. 1, figs. 8*).—A morphological, a serological, and a physiological study in connection with virulence and acid agglutination studies are made of the organisms causing bean wilt, including *B. flaccumfaciens*, bean blight, *B. phaseoli*, and soy bean pustule, *B. phaseoli sojense*, and the results are detailed. These three forms all differ serologically and can be differentiated by means of the agglutination test. *B. flaccumfaciens* serologically stands apart from *B. phaseoli* and *B. phaseoli sojense*, which are closely interrelated. This is said to be in harmony with cultural findings. All these organisms are more pathological to plants when the temperatures are high.

Correlation of host and serological specificity of Bacterium campestre, Bact. flaccumfaciens, Bact. phaseoli, and Bact. phaseoli sojense, G. K. K. Link and C. G. Sharp (*Bot. Gaz., 83 (1927), No. 2, pp. 145–160*).—This paper and that above by Sharp are said to have arisen out of the project of the pathology division of the Hull Botanical Laboratory for a study of the phenomena of resistance or immunity-susceptibility as seen in the field of phytopathology.

It is concluded that the agglutination test can be used to differentiate *B. campestre* from *B. phaseoli*, *B. phaseoli sojense*, and *B. flaccumfaciens*. Serologically *B. campestre*, although distinct, is closely related to *B. phaseoli* and *B. phaseoli sojense*, but less closely to *B. flaccumfaciens*.

Cytological studies of crowngall tissue, A. J. Riker (*Amer. Jour. Bot., 14 (1927), No. 1, pp. 25–37, pl. 1, figs. 5*).—For several years the author has studied interrelationships between *Bacterium tumefaciens* and its host, as well as the influence of conditions (E. S. R., 49. p. 645; 50, p. 42; 53, pp. 443, 645; 54, pp. 452, 842; 55, p. 850; 56, p. 746; 57, p. 253). These studies, and the conclusions of others, as Robinson and Walkden (E. S. R., 52, p. 146), are considered to have presented a new viewpoint on the crown gall problem. With this new conception it was thought that cytological studies might yield a worthy outcome, and the present paper gives the results of such work. What is termed an abstract of this work has been noted (E. S. R., 57, p. 252).

In a summary of this fuller report it is stated that there is a progressive reduction in both gall and wound tissue (in consequence of repeated divisions) in the sizes of cell and nucleus and in the nucleo-cytoplasmic ratio to a minimum from which there is a slight return, the minimum being reached more quickly in the wound tissue than in the gall tissue. Cell inclusions of several types appear to accompany the unusual metabolism of the gall tissue. A reduction in chromosome size accompanies reduction in nuclear size. It is suggested that the first few unequal divisions of the cells of the tissue inoculated with the crown gall organism may be influenced by positive traumatropic responses of the nuclei to the bacteria. In the crown gall tissue of tomato no clear evidence has been found that nuclear division occurs by amitosis or that any cell contains more than one nucleus. The earliest development of vascular elements occurs frequently among the smaller cells, where such development appears to be associated especially with abundant food and mitotic activity. A similarity in structure seems to exist between wound tissue and crown gall tissue in its early stages. The stimulus which produces the gall appears to persist indefinitely and to be comparatively diffuse, while that inducing the formation of wound tissue seems to disappear in a short time and to be comparatively localized.

Studies in the genus Fusarium (section discolor) relative to invasion, A. S. Horne and J. Mitter (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925–1926, pp. 54, 55, fig. 1*).—In work confined chiefly to an investigation of Fusarium (section discolor), all the strains available, including cultures of the same name from different sources, differed in morphological and in physiological details, as color, sclerotial formation, chlamydospores, sporing, degree of septation, and reaction to carbohydrate. Saltation was observed in this section, notably in strains of *F. culmorum* and *F. polymorphum*, as previously in *F. reticulatum* and other fusarial forms. In some cases the parent strains and derived saltants exhibited greater differences than those between the named species, as *F. sambucinum* and *F. sulphureum*. The strains vary in their power of overcoming the internal physiological resistance of the apple fruit to fungal attack. The parent strain and the derived saltant differ in their power of overcoming this resistance, the saltant exhibiting less virulence than the parent.

Report of the imperial mycologist, W. McRae (*Agr. Research Inst., Pusa, Sci. Rpts. 1926–27, pp. 45–55, fig. 1*).—The phytopathological portion of this report gives, in varying degrees of detail, information regarding *Cajanus indicus* wilt, chiefly as regards varietal resistance; sugar cane mosaic and streak; cotton and sesame wilt; *Piper betle* wilt; cinchona studies; *Cicer arietinum* wilt resistance; linseed wilt; maize attack by *Sclerospora maydis;* barley attack by *Helminthosporium sativum;* cotton seedling and guava fruit attack by a Phytophthora (*P. parasitica?*); chili seedling attack by *Pythium aphanidermatum;* sterility in rice grains (*Fusarium* sp. ?); and smut (*Sorosporium paspali*) on *Paspalum scrobiculatum*.

Plant diseases, J. H. Walton (*Agr. Research Inst., Pusa, Sci. Rpts. 1926–27, pp. 42, 43*).—A brief account is given of the occurrence of betel-vine wilt, (supposed) tobacco wildfire, citrus canker, and an areca palm bacterial disease.

Rust susceptibility, a problem in nutritional physiology [trans. title], G. Gassner (*Angew. Bot., 9 (1927), No. 5, pp. 531–541, pl. 1*).—Rust infection severity in cereal foliage, which might at a carbon dioxide concentration of 0.15 per cent be greater than at the atmospheric normal (0.03 per cent), was less at 0.75 per cent, still less at 3.75 per cent, and very slight at 7.5 per cent.

The influence of the nutritional condition of barley on attack by Pleospora trichostoma [trans. title], A. Rippel and O. Ludwig (*Angew. Bot., 9 (1927), No. 5, pp. 541–560*).—In barley stripe, the attacking organism (*P. trichostoma*) developed in inverse ratio to the nutritive condition of the host. Individual nutrients did not produce individually the protective vigor, which corresponded rather to the production of substance by the host.

The fact of a more vigorous development of stripe at low temperatures was confirmed. This is said to show stronger influence than does the opposite tendency of nutrition.

Primary and secondary disinfection [trans. title], G. GASSNER (*Angew Bot., 9 (1927), No. 1, pp. 66–76*).—A germicide may be limited to primary (and temporary) action, as in the case of formaldehyde, alcohol in solution, or hot water; or to secondary action, as in the case of hot water treatments when a difficultly soluble fungicide is gradually taken up and utilized; or a fungicidal preparation may show both classes of action. The behavior and possibilities of certain preparations are discussed.

Wetting seed treatments with small quantities of liquid [trans. title], G. GASSNER (*Angew. Bot., 9 (1927), No. 1, pp. 1–12*).—Work employing several fungicides, indicated with results in tabular form, is considered to show that by the use of fungicides with minimal proportions of liquid the practical advantages of steeping can be combined with those of dry fungicidal treatments.

The rapid seed pickling treatment [trans. title], W. NAGEL (*Angew. Bot., 9 (1927), No. 4, pp. 420–451, fig. 1*).—The principle of the so-called rapid seed pickling treatment is said to consist in the use of very limited proportions of the disinfecting liquids. The author outlines his own practice, employing for wheat or for rye 3 liters of liquid per 100 kg. of seed, for barley 3.5 liters, or for oats 4 liters. In the work thus far, different fungicides have been employed. Results reported or cited, though encouraging, indicate the need for field tests.

Vascular structure and plugging of alfalfa roots, E. L. LECLERG and L. W. DURRELL (*Colorado Sta. Bul. 339 (1928), pp. 19, figs. 16*).—In 1923 Durrell observed a wilting of alfalfa in Iowa (E. S. R., 53, p. 746), and later in conjunction with Sackett he described the disease as occurring in Colorado (E. S. R., 54, p. 449). In 1926 Jones and McCulloch gave a detailed description of the disease and attributed its cause to *Aplanobacter insidiosum* (E. S. R., 56, p. 147).

The results are given of the authors' study of the anatomy of the root of the alfalfa plant and its conduction of water in connection with the wilt and root rot which is said to be common in alfalfa fields in Colorado. The disease is characterized by a stunting of the plants, accompanied by a wilting and flagging of the top. The taproot, when cut, is said to show the cut end to be discolored by a brown or yellowish ring or rings. This discoloration is claimed to be due to a gum deposited in the vessels of the root. The plugging also results in reduced water flow to the leaves, and wilting of the tops occurs. The plugging of the roots is said to occur largely at the crown, the diseased roots show little stored starch, and the plant has but small food reserve available to start growth in the spring.

The structure of alfalfa roots as related to water conduction is described in detail. It was found that the diameter of the root, the area of conducting tissues, and the water flow in a root increased with age, the older roots carrying more water than the younger ones. It is claimed that the upper end of the root, however, conducts less water because it has smaller tracheids in comparison to the younger roots. Less water is conducted by diseased roots than by healthy ones of the same age.

As plugging of the vessels is a common characteristic of this disease, experiments were carried on with a number of chemical compounds, some of which are known to occur in Colorado soils, and it was ascertained that solutions of dibasic calcium phosphate, calcium sulfate, sodium chloride, sodium carbonate, and sodium nitrate injected into healthy roots each resulted in a plugging of the conductive tissue in one or two weeks. The gum produced by these substances is said to react microchemically the same as that found in diseased roots in the field. The fact that corrosive sublimate gave similar results is held to indicate that bacteria are not the sole cause of vascular plugging.

Development of the bacteria causing wilt in the alfalfa plant as influenced by growth and winter injury, F. R. Jones (*Jour. Agr. Research [U. S.], 37 (1928), No. 9, pp. 545–569, figs. 10*).—In a previous paper Jones and McCulloch described a bacterial disease of alfalfa caused by *Aplanobacter insidiosum*, but no relationship was observed between the disease and winter injury (E. S. R., 56, p. 147). Later a brief popular account was given by Jones and Weimer in which attention was called to the connection between bacterial wilt and winter injury (E. S. R., 60, p. 50). The present paper describes in detail the development of the bacteria in the host, the pathological conditions resulting therefrom, and discusses the evidence that indicates a probable relationship between winter injury and the occurrence of the disease.

In discussing the cycle of parasitism of the organism in relation to the alfalfa plant, the author states that the bacteria develop abundantly in the autumn in all invaded parts of the diseased plants, especially in the bases of young shoots that are injured or killed by freezing during the winter. The bacteria are released from the stems by the action of frost in separating the cells of the parenchymatous tissue in which the bacteria are held and in breaking the cortex. They are then distributed in surface water to other alfalfa plants. In the spring the bacteria enter cracks in parenchymatous tissue opened by frost or by growth subsequent to frost injury and produce infection. The infected plants produce diseased stems in the following or second following autumn, and from them frost action again releases the bacteria in the repetition of the cycle.

The yellow discoloration of the wood of the root is said to be characteristic of the disease and is due partly to a yellow insoluble material in the vessels occupied by or in the vicinity of the bacteria and partly to a relatively soluble stain that may diffuse some distance from the infected region. The gum formed in the vessels near the bacteria is considered to be a product of the plant and not of the bacteria.

Seed infection of this disease has not been demonstrated, although it is claimed that the bacteria are found far up the stems of the seed-bearing plants.

The influence of moisture and temperature on cotton root rot, J. J. Taubenhaus and B. F. Dana (*Texas Sta. Bul. 386 (1928), pp. 23, figs. 5*).—The results are given of a study of the influence of rainfall, air humidity, and temperature on the aboveground manifestations of cotton root rot. Wilting of the tops is said to be so conspicuous in affected plants that this symptom was used as an evidence of the presence of the disease.

Of the three factors, rainfall was found to be outstanding in its importance. Humidity appeared to have no direct influence. The temperature prevailing during the crop-producing portion of the season seemed to be favorable to the development of the disease. Toward the end of the growing season lowered temperatures reduced root-rot severity in spite of favorable moisture.

An analysis of the data secured is said to show that an adequate supply of moisture at the early part of the season favored development of the disease regardless of the rainfall additions. In mid season, however, a drought period is said to usually occur which checks root rot. In 1926, no mid-season drought occurred, and root rot continued to develop throughout the season, with the result that more than 50 per cent of the plants died. The suppression of root rot in years when the soil moisture was limited and its continued development in a year of abundant moisture are held to indicate that rainfall is a very critical factor and actually controls the mid- and late-season development of the disease.

Favorable temperature for root rot is reported to occur during the crop-producing portion of the season, when the temperature is favorable for development of the disease to a high degree of severity. In September and October, however, lowered temperatures become the limiting factor and cause a sharp reduction in its occurrence. Checking the disease this late in the season does not tend to lessen its destructiveness, since at that time practically all dying plants have produced a crop which is not greatly injured.

Biology of potato canker, II [trans. title], F. Esmarch (*Angew. Bot., 9 (1927), No. 2, pp. 88–124*).—The present section of this work, the first of which has been noted (E. S. R., 59, p. 642), deals with the duration of the rest period of sporangia of *Synchytrium endobioticum* and their dependence upon relations. A necessary condition of germinability of the resting spores is an afterripening process involving a rest period, shorter or longer according to the age of the sporangia and presumably also according to the time of their release from the host plant, but more particularly according to external factors operative during the rest period.

Seed treatments to control scab and Rhizoctonia on potatoes (*Connecticut Storrs Sta. Bul. 150 (1928), pp. 9, 10*).—A brief report is given of results of seed treatments to control scab and Rhizoctonia on potatoes on land that had not been plowed for at least 50 years. Two lots of seed were used, one badly infected with scab and the other with Rhizoctonia, and 12 treatments were tested for the control of scab and 18 for the control of Rhizoctonia. As the land was acid, having a pH of 5.0, a strip across all plats was limed liberally.

On the limed land all treatments for scab control averaged 70.5 per cent clean tubers, while on the unlimed land the percentage was 93.1. Considering the results on the limed land, corrosive sublimate gave the cleanest crop, followed closely by hot formalin, Bayer Dipdust, and Semesan Bel. The regular formalin treatment gave results that were only slightly better than no treatment. Presprinkling the tubers 3 days before treatment did not increase the effectiveness of either formalin or corrosive sublimate. It is claimed that none of the new organic mercury compounds was as effective as hot formalin or corrosive sublimate.

In the experiments for the control of Rhizoctonia there was little difference in the percentage of clean tubers between limed and unlimed land. Where the tubers were treated with corrosive sublimate practically the entire crop was clean. Hot formalin produced a crop with 92 per cent clean tubers, while the regular formalin treatment on presprinkled seed tubers gave only 83 per cent free from disease. The highest percentage of clean tubers from any of the new organic mercury treatments was 85, but most of them did not give any better results than the untreated seed.

In testing the effect of lime on yields, the scabby seed yielded 24 bu. per acre more on the limed than on the unlimed land, while the Rhizoctonia-infected seed yielded 27 bu. per acre more on limed than on unlimed land.

[Sugar cane diseases, Queensland], E. J. F. Wood (*Queensland Agr. Jour., 27 (1927), No. 4, pp. 273–275*).—Sugar cane mosaic was found in nearly one-third of the farms visited at Beenleigh, and in many in the Nambour district where it has been for 20 years. It is also prevalent in the Pialba area. The variety Q. 813 is highly resistant to mosaic, and N. G. 48 is susceptible but tolerant. Gum is the most important problem in the Nambour district, D. 1135 being susceptible and Q. 813 is far more resistant. No cane is really immune to mosaic, gum, or Fiji, but with Q. 813 the few stools that may become infected can be economically rogued and burned. Fiji disease has been seen on 20 farms in the Maryborough district.

Histological studies of resistance in tobacco to Thielavia basicola, G. H. Conant (*Amer. Jour. Bot., 14 (1927), No. 8, pp. 457–480, pls. 6*).—Plants of seven tobacco varieties ranging from highly susceptible to highly resistant, grown in sterilized soil or in soil infested with *T. basicola* at 20, 25, and 30° C. continuously for six weeks, showed on microscopic examination of healthy roots a lag in the initiation of pericyclic division with regard to the cambial development. This resulted in an unprotected primary cortex and especially in an unprotected gap at the point where branch roots had ruptured the cortex.

Cork formation was stimulated in susceptible varieties by relatively high temperatures, until at 28° and above the initiation of pericyclic activity occurred almost as early as in very resistant varieties at or below a temperature of 20°. In Xanthia, the most resistant variety of tobacco studied, the pericycles of both main and branch roots showed active division from the beginning of cambial growth to maturity, and at all temperatures employed. A distinct correlation was noted between resistance and cork formation in the tissues underlying the lesions. More than 50 per cent of all lesions occurred at the bases of branch roots. Epidermal layers and cork layers were very resistant to mechanical penetration by the fungus. Root tips and adjacent elongating regions appeared to be immune to attack by Thielavia, due supposedly to the resistance of their suberized epidermal cells, to an outstripping of the fungus by growth, or to a combination of these factors. The primary cortex of all varieties except Xanthia allowed easy fungal invasion after penetration of the epidermal layer.

Cork cell walls and other suberized and lignified walls are slowly changed to pectin-like substances in the presence of mycelium masses. Fungal entrance stimulates premature local pericyclic division in young roots of resistant plants in advance of invasion. All secondary tissues of resistant roots except dead xylem elements are able under fungal stimulation to produce cork cells by developing a phellogen in advance of invasion. Neither host nor parasite appears to produce substances particularly toxic to the other. The crowns of tobacco plants and portions of stems buried in transplanting exhibit the corking-out reaction even more markedly than do the roots. The rapidity with which a tobacco plant can initiate and continue cork formation beneath a lesion is an accurate criterion of its resistance to Thielavia.

A new tobacco disease in Hungary [trans. title], H. Kern (*Angew. Bot., 9 (1927), No. 4, pp. 451–458*).—Early in the summer of 1926 a tobacco disease was reported from portions of Hungary which was thought to be new to that country. It appeared to be in relation to the first long period (end of May to middle of June) of precipitation of that rainy and cool summer. Almost all tobacco varieties appeared susceptible. The rapidity of spread supported the idea of its identity with what is known in America as wildfire. Protective measures are tentatively discussed.

Factors affecting the internal resistance of apple tissues to fungal attack, A. S. Horne (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925–1926, pp. 52, 53*).—The rotting capacities are shown comparatively for 8 fungi, each tested for 8 and 18 weeks at 12 and at 3° C., the basis for comparison being the amount of rotted flesh by weight produced in a sample of Cox Orange Pippin apples. Marked differences, which are discussed, from season to season occur in the resistance of apples from the same orchard to fungal attack.

The development of bitter pit in stored apples, A. J. M. Smith (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925–1926, pp. 59–61*).—Results of this work, in some detail, have been published (E. S. R., 57, p. 650).

Though apple bitter pit may become visible at almost any stage, it usually appears within a month before or after the normal picking time. In some varieties, as Cox Orange Pippin in Tasmania, it develops oftener in storage than before picking, at which time the fruit may appear free from injury. The trouble may appear within a few days, however, and develop rapidly (that is, attacking new fruits) for two or three weeks, after which the outbreak and spread slow down and practically cease.

Cold storage may retard bitter pit, but it is not quite certain that it lessens the ultimate loss; and in a sample of Cleopatras from Western Australia, showing considerable bitter pit before being gathered, experimentation contradicted the tendency shown above. The effect of low temperatures appears not to be so simple as has been supposed, and further tests are needed.

Degree of maturity on picking affected markedly subsequent bitter pit development, at least in Ribston Pippin and Cox Orange Pippin. Bitter pit development was much slower in the apples left on the tree, and the rate after picking was less after the second picking than after the first. It appears as if such apples had tided over, on the tree, the critical period during which bitter pit was likely to develop, and had eventually become immune. It is thought that, with more rapid and more thorough refrigeration on board ship, or better still, with a general system of cooling before shipment, it should be possible for the fruit to remain longer on the tree and still arrive in England without being ripe, and with enhanced attractiveness and value.

The development of internal breakdown in cold-stored apples, F. Kidd and C. West (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925–1926, pp. 45–47, figs. 2*).—Two conditions indicated as characteristic, respectively, of the earlier and of the later stage of internal breakdown of cold-stored apples, though merging into one another, are a slight diffuse browning found in the flesh or part of it, the tissue remaining firm; and a softening of the flesh accompanied by deep browning. Short keepers, developing early internal breakdown, show a first stage of short duration. Long keepers show a long first stage. These facts are illustrated in tabular detail.

The duration of the first stage may be so long (nearly four months in apples grown on silt) in the better keeping apples as to give rise to an erroneous belief that it constitutes a distinct disease.

The development of internal breakdown is accompanied during its early stages by a considerable increase in the carbon dioxide production rate, but by the time the deep brown condition of the flesh is reached respiration has ceased.

Temperature conditions in refrigerated holds of ships carrying fruit, A. J. M. Smith (*[Gt. Brit.] Dept. Sci. and Indus. Research, Food Invest. Bd. Rpt. 1925–1926, pp. 55–59*).—What are said to have been the main results of the study of the conditions here discussed have been noted (E. S. R., 57, pp. 139, 650). The present account deals briefly with inequalities of temperature, comparison of different systems, air movement and stowage, initial rise of temperature during cooling period, and need for distant-reading thermometers.

Further studies of the brown-rot fungi.—II, A contribution to our knowledge of the distribution of the species of Sclerotinia causing brown-rot, H. Wormald (*Ann. Bot. [London], 41 (1927), No. 162, pp. 287–299*).—During several years, the author obtained from various sources specimens and cultures of Sclerotinia causing fruit tree brown rots in order to compare them with the fungi causing like diseases in Great Britain. Accounts regarding some of these have been noted (E. S. R., 47, p. 546; 49, p. 248).

The present distribution of the common brown-rot fungi, so far as obtained from the literature and the study of the collected strains, is indicated. It is stated that *S. americana* occurs in the United States, British North America, Australia, and New Zealand; *S. cinerea mali* in Great Britain and Ireland, and probably on the Continent; *S. cinerea pruni* in Europe, the Pacific coastal part of North America, and Manchuria; and *S. fructigena* in Europe, Japan, and Manchuria. The economic significance of this distribution is discussed.

On the shot-hole disease caused by Clasterosporium carpophilum and on the "shot-hole" effect, G. SAMUEL (*Ann. Bot. [London], 41 (1927), No. 162, pp. 375–404, pls. 2, figs. 18*).—Discussion is offered of the names *C. carpophilum* and *Coryneum beyerinckii* for the fungus causing a leaf shot hole of many stone-fruit trees, besides other plant diseases.

Infection of almond leaves is shown to occur by penetration of the cuticle. The hyphae grow in the substance of, or pass directly through, cellulose walls which swell when in the vicinity of the fungus mycelium. The growth of the fungus within the leaf is described as slow and scant, the host cells dying in advance of the fungus hyphae. The reaction of almond leaves to infection by the fungus is described. The influence of moisture as a determining factor as to whether abscission occurs or not is dealt with. The possible mechanism of meristem formation around the infected tissue is discussed.

Time-temperature relations in different types of peach-rot infection, C. BROOKS and J. S. COOLEY (*Jour. Agr. Research [U. S.], 37 (1928), No. 9, pp. 507–543, figs. 30*).—In a previous paper the authors described the behavior of these fruit rots at constant temperatures (E. S. R., 47, p. 151). The present publication reports the behavior of Monilia and Rhizopus in a gradually falling temperature, such as prevails in a refrigerator car. It also gives data on shipping results with sprayed and unsprayed fruits.

Monilia and Rhizopus rots are said to increase in diameter at an approximately uniform rate in different stages of development, the diameter of the rots becoming a fairly accurate basis for temperature comparisons. With both fungi, low temperatures were found to have a relatively higher inhibiting action upon development during the incubation period than during the later growth. With both incubation and growth a 5° C. change in temperature had a greater effect at the lower temperatures than at the higher ones in experiments ranging from 0 to 30°.

With inoculations made by dusting spores over punctured peaches, the incubation period for Monilia was found to be about twice as long as with needle inoculations, and with spores dusted over apparently sound peaches the incubation period was still further prolonged. A similar contrast was found with Rhizopus, except that the fungus was apparently unable to penetrate the sound skin of market-ripe peaches. The rots from Monilia dust inoculations continued to appear over a long period of time, whereas those from needle inoculations started practically together. With Rhizopus there was a considerable spread of the infection period in the case of both needle and dust inoculations. When once established, both kinds of rots that had resulted from dust inoculations enlarged as rapidly as those from needle inoculations. Peaches that were punctured and then dusted with Monilia spores developed about 4.5 times as many rots as those that were dusted without puncturing and 160 times as many as untreated peaches. Apparently sound unsprayed peaches developed about 4 times as many rots in transit as similar sprayed peaches.

With dust inoculations and with fruit that had not been inoculated the contrast between the top and bottom of the car and between delayed and immediate cooling was shown in a number of rots rather than in their average size. Monilia needle-inoculation rots appeared from 17 to 65 hours earlier in the top of the car than in the bottom and averaged about 42.5 hours earlier. Peaches that were punctured and then dusted with Monilia spores from 1 to 6 hours before loading developed about 50 times as many rots in the top as in the bottom of the car, and peaches similarly treated from 14 to 21 hours before loading developed about 4 times as many rots in the top as in the bottom of the car.

A variety of Collybia dryophila parasitic on dewberry, R. F. POOLE (*Jour. Elisha Mitchell Sci. Soc., 43 (1927), No. 1–2, pp. 101–104, pls. 3*).—An account and recommendation as to further study are given regarding a destructive disease of the Lucretia dewberry (*Rubus* sp.) ascribed to a strain of *C. dryophila*, which is dealt with descriptively though briefly.

Diseases affecting buds and stems of raspberry, J. P. KAERTHAUS (*Het Afsterven van Stengels en Knoppen bij de Roode Framboos. Proefschr., Rijks-Univ., Utrecht, 1927, pp. VIII+55+[2]*).—This thesis deals with stem and bud diseases affecting European red raspberry (*Rubus idaeus*) varieties, in particular troubles associated with the presence of *Didymella applanata*, *Coniothyrium fuckelii*, *Gloeosporium venetum*, *Verticillium* sp., *Botrytis cinerea*, *Hendersonia rubi*, and *Pseudomonas tumefaciens*. Discussion is given regarding the basis for combined treatment directed against *G. venetum*, *D. applanata*, and *P. tumefaciens*.

Note on the occurrence of Pythium proliferum, de Bary, on the roots of the strawberry, C. W. WARDLAW (*Ann. Bot. [London], 41 (1927), No. 164, pp. 817, 818*).—This brief report, related to one which has been noted (E. S. R., 59, p. 545), states that about the beginning of July, 1927, the author found *P. proliferum* growing on living roots of the cultivated strawberry in Lanarkshire.

During recent years a disease of the roots of the cultivated strawberry has caused great economic loss in the fruit-growing districts of the Clyde Valley. The disease has been ascribed to unfavorable soil conditions coupled with the attack on the weakened roots by parasitic soil fungi, including the more common species *P. debaryanum*, which was associated with blemished and decayed roots during all the seasons and was frequently found in diseased roots taken from fields where the soil is apt to lie wet. The observations outlined suggest that the saprophyte *P. proliferum* is also, under certain circumstances, a facultative parasite. In order to attack the roots in question the parasitic powers need not be highly developed, as the young roots in this case are not healthy but are soft and lax and poorly aerated.

The material examined showed considerable variation, but in the main mycelium, sporangia, zoospore liberation, and proliferation agree with this species, though certain minor differences were observed.

Diseases and insect pests of the strawberry in Louisiana, A. K. PLAKIDAS and C. E. SMITH (*La. Agr. Col. Ext. Circ. 113 (1928), pp. 34, figs. 14*).—Popular descriptions are given of the more common diseases and insect injuries of the strawberry in Louisiana, and known remedial measures are discussed.

Phytophthora blight of citrus, G. O. OCFEMIA and E. F. ROLDAN (*Amer. Jour. Bot., 14 (1927), No. 1, pp. 1–15, pls. 2, figs. 4*).—Citrus Phytophthora blight is said to occur at Los Banos, P. I., but in no other citrus-growing region so far as known. Reinking is credited with having first reported this disease (E. S. R., 46, p. 746). The symptoms are briefly described, and a study is detailed of the causal organism.

The disease is said to be associated with a Phytophthora supposedly identical with *P. faberi*, which causes coconut bud rot and cacao pod black rot in the Philippines. The conidia and chlamydospores are slightly smaller than those described by Reinking and by Rosenbaum (E. S. R., 36, p. 747). The fungus is pathogenic on various plants, as citrus, coconut (seedlings), cacao (pods), and eggplant. Species of citrus differ in susceptibility. The disease persists during moist weather and in shady or low places, causing as high as 90 per cent of blight in seed beds and 30 per cent of rot in nursery rows. Destruction of diseased prunings, seed bed sterilization, avoidance of damp localities, and spraying with Bordeaux mixture in nursery and in field afforded satisfactory protection.

The relationship between the Phytophthorae associated with the bud-rot diseases of palms, C. H. GADD (*Ann. Bot.* [*London*], *41* (*1927*), *No. 162, pp. 253–280*).—For those insufficiently understood diseases of palms in which the terminal bud rot is preceded by the drooping and wilting of the older leaves, the general adoption of such a term as "wilt" is urged, as is the reservation of the term "bud rot" for those diseases in which the rot results from a primary infection in or near the bud tissues.

Effective treatment of bud rot consists in the destruction of the crowns of the diseased plants. For wilt, some further measure is probably necessary.

The occurrence is recorded of a coconut palm bud rot associated with a Phytophthora, possibly *P. palmivora*. The agency is reported of a Phytophthora believed to be *P. arecae* in connection with a fruit fall and bud rot of areca palms in Ceylon. Oospores of this strain have not been obtained in nature or in pure cultures, though chlamydospores were found in culture. Attention is called to the similarity of the morphological characters (in the absence of oospores) of *P. faberi*, *P. palmivora*, *P. arecae*, and *P. meadii*. The only safe criteria for species determination in Phytophthora are the size and other characters of the sexual organs. Cross-inoculation experiments with Ceylon strains from cacao, coconut, and areca are described, and biological differences are noted. Experiments were carried out with mixed cultures of strains of *P. faberi* and the strains from coconut and areca. No oospores were obtained when the areca strain was grown in mixed culture with any of the *P. faberi* strains, but oospores were obtained abundantly when the coconut fungus was grown with a strain of *P. faberi* from Odontadenia.

The Ceylon strains from coconut and cacao are of the same sex, whereas in the West Indies the strains from these hosts are of opposite sex. The question of the synonymy of *P. faberi* and *P. palmivora* is discussed.

Blight of asparagus fern, F. A. WOLF (*Jour. Elisha Mitchell Sci. Soc., 43* (*1927*), *No. 1–2, pp. 91–96, pls. 2*).—A blight of *Asparagus plumosus* is described as widely prevalent in Florida, supposedly for some years, and as now practically coextensive with this host, at least within the State. The disease is due to a fungus said to have been identified in its pycnidial stage as *Ascochytula asparagina*. An ascomycete morphologically identical with *Didymosphaeria brunneola* occurs on decaying stems and forms in culture a pycnidial stage indistinguishable from *A. asparagina*. Its pathogenicity has been proved by inoculations with pure cultures. Frequent applications of dilute Bordeaux mixture are said to give satisfactory control.

Comparative study of spermogonia of rusts of Abies, L. M. HUNTER (*Bot. Gaz., 83* (*1927*), *No. 1, pp. 1–23, pls. 4, figs. 2*).—This comparative study of 12 rusts is summarized in tabular form.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The tree rat (Mus rattus rufescens Gray), a little known pest of coconut culture in Java [trans. title], W. C. VAN HEURN (*Landbouw* [*Buitenzorg*], *4* (*1928*), *No. 1, pp. 48–56, figs. 2; Ger. abs., p. 56; also in Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Korte Meded. Inst. Plantenziekten, No. 9* [*1928*], *pp. 9, figs. 2; Ger. abs., p. 9*).—An account of an important pest occurring in Java, generally identified with the field rat (*M. rattus brevicaudatus* Horst &

De R.), the biology, ecology, and geographical distribution of which have hitherto been little known.

How to overcome objections to the bacterial method of controlling rodents [trans. title], S. S. MEREZHKOVSKIĬ (MERESHKOWSKY) (*Gosud. Inst. Opytn. Agron. [Leningrad], Trudy Selsk. Khoz. Mikrobiol. (State Inst. Expt. Agron., Bul. Bur. Agr. Microbiol.), 1 (1926), pp. 145–152*).—The author suggests the use of the Merezhkovskii bacillus (*Bacillus typhi spermophilorum*) as a means of destroying mice, thus avoiding resort to the use of Danysz' bacillus. It is recommended that frequent transfers of Danysz' bacillus on 10 per cent chicken protein extracts be made in order to keep up the virulence of this organism.

On the practical value of the bacterial method of controlling rodents [trans. title], B. V. USPENSKIĬ (B. W. USPENSKY) (*Gosud. Inst. Opytn. Agron. [Leningrad], Trudy Selsk. Khoz. Mikrobiol. (State Inst. Expt. Agron., Bul. Bur. Agr. Microbiol.), 1 (1926), pp. 153–167*).—Following a discussion of the disadvantages of mechanical and chemical methods of exterminating rats and mice, the advantages obtained by the use of Danysz' bacillus and Merezhkovskii's bacillus are pointed out.

Bird migration from the point of view of light and length of day changes, H. A. ALLARD (*Amer. Nat., 62 (1928), No. 682, pp. 385–408*).—This subject is presented in connection with 17 references to the literature, a list of which is included.

The European starling in the United States, E. R. KALMBACH (*U. S. Dept. Agr., Farmers' Bul. 1571 (1928), pp. II+27, figs. 8*).—This is a practical summary of information on the European starling based upon an extensive study conducted by the author. It is pointed out that most of the starling's habits are of benefit to man or of an economically neutral nature. Nevertheless it has certain tendencies to harm. These have been intensified by the bird's flocking habits, as well as by a general increase in abundance in recent years, and have led to insistent demands for a curtailment of the number. The remedy, when it becomes a pest, consists in local control, suggestions as to measures applicable being included.

The spread of the European starling in North America (to 1928), M. T. COOKE (*U. S. Dept. Agr. Circ. 40 (1928), pp. 10, pl. 1, fig. 1*).—Following a brief introduction and description of the starling, accompanied by colored illustrations of the plumages of starlings, the author deals with the original introduction and establishment, methods of spread, extension of range. present extent of range (January, 1928), probable future extensions, and economic status.

A critical factor in the existence of southwestern game birds, J. GRINNELL (*Science, 65 (1927), No. 1691, pp. 528, 529*).—The author concludes that there is a critical distance, which, rain or dew failing, is the absolute limit a quail's nest may be located from safely accessible water and result in a matured brood. If a pair of quail can not find suitable cover and safety for its nest within 400 yds. from water which will be accessible by the newly hatched young on foot, either the attempt is abandoned or that nesting is destined to failure. The common observation that few quail are raised in years of severe drought is considered to support this view.

Do southwestern quail require water? C. T. VORHIES (*Amer. Nat., 62 (1928), No. 682, pp. 446–452*).—The author reports upon observations made in Arizona which have led him to conclude that hunting is or has been the chief factor in delimiting the quail population in the arid Southwest.

Contributions to the knowledge of the action of the venom of scorpions [trans. title], O. DE MAGALHÃES (*Mem. Inst. Oswaldo Cruz, 21 (1928), No. 1,* *pp. 5–159, pls. 12; Fr. abs., pp. 155–159).*—This is a detailed account of studies conducted at Bello Horizonte, State of Minas Geraes, Brazil, of four species of scorpions, namely, *Tityus bahiensis*, *T. serrulatus*, *T. dorsomaculatus*, and *Bothriurus* sp. The account is given in connection with an 8-page list of references.

Catenaria anguillulae as a parasite of the ova of Fasciola hepatica, J. B. Butler and J. J. C Buckley (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1928), No. 45, pp. 497–512, pls. 4*).—The authors record the occurrence of a chytridiacean parasite, *C. anguillulae*, in the ova of *F. hepatica*, and suggest the possibility of using it as a means of checking the infection of snails by miracidia.

A list of publications of Antonio Berlese [trans. title] (*Redia, 16 (1927), No. 1–2, pp. VIII+XIX*).—A total of 238 contributions is listed.

Water conservation in insects, W. Robinson (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 897–902, figs. 2*).—It was found in work at the Minnesota Experiment Station that insects which live on food low in water have the capacity, like cactus, of holding much of their water in the bound or colloidal condition. In this form water is held firmly against the force of desiccation, this capacity varying inversely with the total water content of the insect.

Responses of insects to smell and taste and their value in control, N. E. McIndoo (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 903–913*).—This is a review of the literature in connection with 51 references to the literature.

Notes on the chemotropic responses of certain insects, A. C. Morgan and S. E. Crumb (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 913–920*).—The authors report upon studies of insect chemotropism conducted over a period of 14 years at Clarksville, Tenn.

A soil sifter for subterranean insect investigations, M. C. Lane and F. H. Shirck (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 934–936, pls. 2*).—The authors describe a soil sifting machine, the use of which facilitates investigations of subterranean insects, particularly wireworms.

[Notes on economic insects] (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 938–940*).—An account is given of the Distribution of *Phthorimaea operculella* Zeller, by T. D. A. Cockerell (p. 938); of Talc and Mica Dusts as a Control for Lepidopterous Larvae, by B. F. Driggers (pp. 938, 939); of A Suggestion for a Possible Application of Ovipositional Chemotropism, by J. W. Lipp (p. 939); of *Copidryas cosyra* Druce, an Enemy of Cactus on the West Coast of Mexico, by J. C. Hamlin (pp. 939, 940); and Sulphur in the Control of Mites in Parasite Breeding Laboratories, by G. M. List, L. B. Daniels, and C. J. Bjurman (p. 940).

[Economic insects of New Jersey] (*N. J. Dept. Agr. Circs. 54 (1922), pp. 24, figs. 8; 56 (1922), pp. 23, figs. 13; 58 (1923), pp. 26, figs. 11; 61 (1923), pp. 8, figs. 6; 64 (1923), pp. 4, figs. 2; 68 [1923], pp. 8, figs. 5; 76 (1924), pp. 19 figs. 6*).—These circulars deal, respectively, with The Lace Bugs of New Jersey, by H. G. Barber and H. B. Weiss; Work against the Gipsy Moth in New Jersey, by H. B. Weiss; Beetles of the Genera Saperda and Oberea Known to Occur in New Jersey, by A. J. Mutchler and H. B. Weiss; Sprays for the Control of the Japanese Beetle, by R. W. Kelley and W. Moore; The Occurrence of the Devastating Nematode of Europe, *Tylenchus dipsaci* Kuhn, in New Jersey, by H. B. Weiss; The Chinese Mantis, a Beneficial Insect in New Jersey, by H. B. Weiss; and The Oil and Blister Beetles of New Jersey, by A. J. Mutchler and H. B. Weiss.

[Economic insects and their control in Ontario] (*Fruit Growers' Assoc. Ontario Ann. Rpt., 59 (1927), pp. 7–12, 38–41*).—The several papers here presented relating to insect control are The Apple Aphid Problem in Ontario (pp. 7–10) and Lubricating Oil Sprays for the Control of the Pear Psylla (pp. 10–12), both by W. A. Ross, and The Apple Maggot or Railroad Worm, by L. Caesar (pp. 38–41).

[Report on economic entomology in British Guiana], L. D. Cleare, Jr. (*Brit. Guiana Dept. Sci. and Agr. Rpt. 1926, pp. 61–70*).—The occurrence of and work with the more important insects of the year are reported upon.

Insect enemies of agriculture [trans. title], O. Monte (*Bol. Agr., Zootech. e Vet. [Minas Geraes], 1 (1928), Nos. 2, pp. 28–52, figs. 16; 3, pp. 9–42, figs. 4*).—A general account is given of the forms of Lepidoptera of economic importance in the State of Minas Geraes, Brazil.

Stained cotton in Fiji and its causes, H. W. Simmonds (*Agr. Jour. [Fiji], 1 (1928), No. 1, pp. 10–12*).—Experiments are reported which show that the brown stain is produced by *Tectocoris lineola*, it being apparently mechanical and freely produced by insects reared under cover in captivity. Although punctures of the bolls and proliferation take place freely when fourth to adult stage *Dysdercus insularis* feed upon cotton, no stain is produced upon the lint as a result of such feeding when clean fed Dysdercus are used. The yellow stain, as also many of the cases of rotting and aborting of the bolls, is due to the introduction of fungus spores by the insects when feeding, after having previously fed upon diseased bolls.

The protection of animal fibres against clothes moths and dermestid beetles, C. O. Clark (*Textile Mercury, 79 (1928), No. 2066, pp. 281, 282*).—This abstract from a paper presented at the autumn conference of the Textile Institute at Bury, England, deals particularly with the only preparations commercially used in the British industry, known as Eulans, which were originated by Meckbach and have resulted from the prolonged research work conducted by a commercial company, beginning in 1917. Several forms of Eulans, which are protected by many patents covering a wide range of substances, are considered. It is stated that while Eulan Extra is only physically fixed in the fiber, Eulan W Extra is chemically combined with the wool.

Insect enemies of fruit trees, I. H. Latière, B. Trouvelot, and F. Willaume (*Les Ravageurs des Arbres Fruitièrs. Paris: Maurice-Mendel, 1928, vol. 1, pp. 97, pls. 7, figs. 175*).—This is a practical account in which the first chapter (pp. 19–35) deals with means of contrôl, and chapter 2 (pp. 37–97) consists of tables and illustrations for identification.

Notes on the insects of the sea-grape, Coccoloba uvifera (L.) Jacq., in Porto Rico and adjacent countries, G. N. Wolcott (*Bul. Ent. Research, 17 (1926), No. 1, pp. 49–52*).—The author finds that in Porto Rico the sea grape, commonly met with on sandy beaches, serves directly or indirectly as food or shelter for 24 or more insects. A number of these occur only in Porto Rico or immediately adjacent islands and in many cases are restricted to this particular host plant.

Montana's laboratory for the study of insect-borne diseases, R. A. Cooley (*Amer. Jour. Pub. Health, 18 (1928), No. 8, pp. 993–996*).—This is a description of the laboratory erected at Hamilton, Mont.

Insecticides and fungicides, F. T. Shutt (*Canada Expt. Farms, Div. Chem. Rpt. 1927, pp. 66–73*).—This reports upon chemical analysis and physical examination of the more commonly used materials sold in Canada, including arsenate of lead, calcium arsenate (arsenate of lime), soluble arsenic in calcium arsenate-lime sulfur sprays, weevil bait, derris root, fly and moth preparations, and oils and insecticides.

A method of volatilizing carbon bisulfide for soil fumigation, H. K. Riley (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 932, 933, pl. 1*).—In this contribution from the Indiana Experiment Station, the author reports upon a method of volatilizing carbon disulfide with steam which was successfully employed in soil fumigation tests for the control of the greenhouse centipede (*Scutigerella immaculata* Newp.) infesting ground beds in a commercial greenhouse at Indianapolis. The carbon disulfide was placed in a steel drum and steam under 50 lbs. pressure allowed to pass through, volatilizing the material and forcing the gases into underground tiles extending the length of the bed at a depth of about 16 in. A high mortality of centipedes and other soil-infesting forms was secured.

Effect of early summer and late summer white oil and nicotine sulfate sprays on the number of eggs of the European red mite overwintering on peach trees, B. F. Driggers (*Jour. Econ. Ent., 21 (1928). No. 6, pp. 878–882*).—In this contribution from the New Jersey Experiment Stations the author reports that nicotine sulfate (1: 800) and white oil emulsion (1 per cent) applied to peach trees in May and June were not effective in preventing the subsequent deposition of overwintering eggs of the European red mite. Nicotine sulfate and ground tobacco dust were also ineffective in reducing the number of overwintering eggs when treatments were applied in August. Four applications in August on peaches of a 1 per cent white oil emulsion gave a reduction of 98.9 per cent in the number of overwintering European red mite eggs on peaches.

Influence of spray practices on arsenical residues, H. C. McLean and A. L. Weber (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 921–928, fig. 1*).—This is a contribution from the New Jersey Experiment Stations, in which the authors report that heavy spraying of winter apples in June in that State during a season with more than normal rainfall means that later sprays can not be applied without exceeding the new tolerance. Dusted fruit showed but traces of arsenical residues. Spraying up to July 1 followed by dusting showed very low residues at harvest time. The heaviest residues occur on the lower parts of the trees.

Use of arsenites in the control of Mormon crickets, F. T. Cowan (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 928–932*).—In work in the northern end of Camas Valley in western Montana poisoned bran mash did not prove entirely satisfactory. Sodium arsenite, liquid or dry, and calcium arsenite proved very efficient, especially when the pests were concentrated in small areas and before there was much movement from the hatching grounds.

Leafhoppers of Ohio (Cicadellidae), H. Osborn (*Ohio Biol. Survey Bul. 14 (1928), pp. 199–374, figs. 111*).—This is a synopsis of the leafhoppers of Ohio, in which 346 species and varieties are recognized, of which 292 are definitely included in the fauna of Ohio. It is said that most of the others and many not listed are quite certain to be found in future collecting. A check list of the family Cicadellidae for Ohio is appended.

Hibernation of chinch bugs in Sudan grass, H. R. Bryson (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 857–863*).—In this contribution from the Kansas Experiment Station the author reports upon the examination made of 604 bunches of Sudan grass (*Sorghum vulgare sudanensis*), taken from various types of fields and covering a period of 4 years, which gave a maximum of 540 chinch bugs in a single clump, and an average of 21.1 live bugs per bunch. The counts also showed that Sudan grass, although not as suitable as the native bunch grass, serves as efficient hibernating quarters for the chinch bug. The tall uncut branches or bunches not pastured too closely, which had a dense growth of leaves at the base, were found to furnish the most suitable overwintering quarters for the bugs.

A new genus and species of Jassidae injurious to maize in Kenya Colony, E. Africa, W. E. China (*Bul. Ent. Research, 17 (1926), No. 1, p. 43, fig. 1*).—

Under the name *Cicadulina zeae* n. g. and sp. the author describes a jassid enemy of corn in Kenya Colony.

Exploration in the Argentine Republic for parasites of the beet leafhopper, Eutettix tenellus (Baker), C. F. Henderson (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 863–871, fig. 1*).—In investigations covering a period of 7.5 months in the Provinces of Tucumán, San Juan, Mendoza, and Buenos Aires, and the Territories of La Pampa and Rio Negro, beets having typical curly top foliage symptoms were found in all of these localities excepting Rio Negro, although no beet leafhoppers were taken. A species of Eutettix which greatly resembles the beet leafhopper was captured in almost every locality in which beets or Swiss chard were growing.

The seasonal and ecological distribution of the common aphid predators of central Florida, W. L. Thompson (*Fla. Ent., 11 (1928), No. 4, pp. 49–52*).—This account is based upon records of lady beetles and syrphus flies kept by R. L. Miller from August 1, 1926, to March 7, 1927, at the Citrus Experiment Station at Lake Alfred, Fla.

Mealy bug attacking Paspalum grass in the Cooroy district, W. A. T. Summerville (*Queensland Agr. Jour., 30 (1928), No. 3, pp. 201–209, figs. 6*).—This is an account of an undetermined mealy bug of the genus Pseudococcus which was discovered in November, 1926, killing off many acres of grass on the pastures in part of the Cooroy district, Queensland. It was found to be subject to attack by a number of natural enemies, which, under normal circumstances, may be relied upon to prevent serious damage.

Pseudococcus comstocki Kuw. as an enemy of the banana (Musa cavendishii), R. S. MacDougall (*Bul. Ent. Research, 17 (1926), No. 1, pp. 85–90, pls. 7*).—The author reports upon the finding of four insect and allied enemies of the banana in the Canary Islands during the course of an inspection of the banana plantations in 1924. Two of these, a red spider and a thrips, are said to be of relatively small importance. The other two, a moth miner (*Hieroxestis subcervinella* Walk.) and a mealy bug (*Pseudococcus comstocki*), are much more important enemies. The present paper is devoted to a report of studies of the mealy bug.

The diaspine Coccidae of Japan, III–V, I. Kuwana (*Japan Dept. Finance, Imp. Plant Quart. Serv., Rev. Bur., Tech. Buls. 3 (1925), pp. 1–20, pls. 7; 4 (1926), pp. [1]+44, pls. 12, fig. 1; Japan Min. Agr. and Forestry, Dept. Agr., Sci. Bul. 1 (1928), pp. 1–39, pls. 9*).—These further contributions (E. S. R., 54, p. 554) deal with 12 additional genera, 3 of which are new, and 9 new species.

Aleyrodidae or white flies attacking citrus plants in Japan, I. Kuwana (*Japan Min. Agr. and Forestry, Dept. Agr., Sci. Bul. 1 (1928), pp. 41–78), pl. 1, figs. 9*).—This account deals particularly with the six species of white flies found on citrus in Japan, namely, the orange spiny white fly (*Aleurocanthus spiniferus*), the Marlatt white fly (*Aleurolobus marlatti*), the aucuba white fly (*Tetraleurodes aucubae*), the Giffard white fly (*Bemisia giffardi*), the Japanese bayberry white fly (*B. myricae*), and the citrus white fly.

New Encyrtinae from Japan, T. Ishii (*Japan Dept. Finance, Imp. Plant Quart. Serv., Rev. Bur., Tech. Bul. 3 (1925), pp. 21–30, pl. 1*).—In this contribution, dealing with material obtained from the breeding of scale insects injurious to citrus trees about Nagasaki, Japan, together with aphids obtained in the field, the genus Pareusemion is erected and six species are described as new.

A cooperative estimate of the loss caused by the sugar-cane moth borer, T. E. Holloway and W. E. Haley (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 852–854*).—The authors give an account of the method of estimating the loss caused by the sugar cane borer to the Louisiana sugar crop employed by the U. S. D. A. Bureaus of Entomology and Agricultural Economics.

Report of investigations on the biology and control of the European corn borer in south Germany in 1926 [trans. title], W. Zwölfer (*Arb. Biol. Reichsanst. Land u. Forstw., 15 (1927), No. 3, pp. 355–400, pls. 5, figs. 3; abs. in Rev. Appl. Ent., 16 (1928), Ser. A, No. 2, pp. 56, 57*).—The European corn borer has long been established in Baden, occurring in all the corn-growing districts, its seasonal occurrence corresponding with that in the Province of Ontario, Canada. Studies of its life history have shown that there is one generation a year there. Two parasites, *Microgaster tibialis* Nees and *Eulimneria crassifemur* Thom., are of some importance The average crop loss is said to vary from 5 to 10 per cent at a conservative estimate. A list is given of 58 references to the literature.

Reactivating anhydrobiosis in the development of the European corn borer [trans. title], E Roubaud (*Compt. Rend. Acad. Sci. [Paris], 186 (1928), No. 12, pp. 792, 793; abs. in Rev. Appl. Ent., 16 (1928), Ser. A, No. 6, p. 300*) — The author concludes that the question of two generations of the European corn borer depends upon the intervention at the right time of a warm, dry estivation period, followed by a fairly long, warm, and damp period.

Notes on the genus Hyponomeuta, with special reference to H. cognatellus H., H. padellus L., and H. malinellus F., R. Adkin (*So. London Ent. and Nat. Hist. Soc. Proc., 1927–28, pp. 48–54, pls. 3*).—This article deals with the genus Hyponomeuta, eight or nine species of which occur in Great Britain.

Are codling moths attracted to lights? M. A. Yothers (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 836–842*).—The author reports that in a test in 1926 codling moths were readily attracted to a small light and again in 1927 in large numbers to varying intensities of light in light traps in the State of Washington. It is pointed out that these tests made do not prove that such traps as were tried are of any considerable control value.

Control of codling-moth: Subduing the pest and removing spray residue, F. W. Pettey, A. Skibbe, and F. de Villiers (*Union So. Africa Dept. Agr., Ent. Note 37 (1927), pp. 7*).—This article outlines the results of tests of methods for the removal of spray residue from pears and of tests with substitutes for lead arsenate sprays.

Some observations on the number of larval instars of the oriental peach moth, Laspeyresia molesta Busck, A. Peterson and G. J. Haeussler (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 843–852, figs. 2*).—The authors report that by applying Dyar's ideas that the width of the head capsule of a lepidopterous larva is more or less constant for any instar of a given species and that successive larval instars of a given species show a more or less regular geometric progression in the growth of the head capsules, oriental peach moth larvae are found to have four or five instars. The number of larval instars produced is correlated with the rate of larval growth. As a rule rapid growth produces four instars and slow growth five instars. Rapidity of larval growth is dependent upon at least two factors, temperature and food. High summer temperatures produce rapid growth, while low temperatures, such as occur in the spring and fall, produce slow growth. Larvae develop somewhat faster in peaches than in apples under insectary conditions. The rate of development of individual larvae in a given food varies considerably.

The pink bollworm of Queensland, F. G. Holdaway (*Bul. Ent. Research, 17 (1926), No. 1, pp. 67–83, pls. 2, figs. 9*).—An extended account of the anatomy, bionomics, and distribution of the pink bollworm, which attacks cotton in Queensland and for which the name *Platyedra scutigera* is proposed. Its larval and pupal stages are described. An account of this insect by Ballard has been noted (E. S. R., 54, p. 457; 55, p. 257).

Advancement in mosquito control in the United States and Canada, L. E. JACKSON ET AL. (*Amer. Jour. Pub. Health, 18 (1928), No. 8, pp. 985–992*).—This is an abstract of a report of the committee on mosquito control of the American Public Health Association, presented October 19, 1927. Information on mosquito control was obtained by means of a questionnaire from the health departments of 42 States and Provinces and from the Territory of Alaska.

On anophelism without malaria around Amsterdam, N. H. SWELLENGREBEL, A. DE BUCK, and E. SCHOUTE (*K. Akad. Wetensch. Amsterdam, Proc., 30 (1927), No. 1, pp. 61–68, fig. 1; 31 (1928), No. 4–5, pp. 531–539, figs. 5*).—This is a report of investigations conducted in the vicinity of Amsterdam, where two types of *Anopheles maculipennis* appear to occur in fairly distinct regions, a small variety in the region to the north where malaria is endemic and a large variety in the region to the south where malaria is absent or extremely rare. The two types or varieties are not mixed but show distinct segregation. In the first article the possible factors, morphological and biological, influencing the transmission and nontransmission of malaria by the two varieties are considered at some length.

In the second article the authors report upon investigations made at 46 stations, where 11,122 females were measured and 25,065 were examined to determine the percentage of females carrying blood, fat, or eggs. The anopheline population of two stations were regularly examined over a period of two years.

Recent investigations of the zoophilous evolution of the Anopheles fauna in Europe (A. maculipennis) as based upon the maxillary armament [trans. title], E. ROUBAUD (*Ann. Inst. Pasteur, 42 (1928), No. 5, pp. 553–618, figs. 16; abs. in Rev. Appl. Ent., 16 (1928), Ser. B, No. 11, pp. 210, 211*).—The author deals with his theory of the origin of zootropism and zootropic races in *A. maculipennis* in Europe, in which his earlier work on the subject is reviewed and the results of further investigations reported. The theory is that regulation and stabilization of the waters in which *A. maculipennis* breeds, together with the permanent housing of domestic animals in buildings in which the adult mosquitoes normally shelter, stabilize its conditions of life; that it acquires, by natural selection, a maxillary armature more and more adapted to feeding on animals; and that the degree of zootropism is indicated by the maxillary index. Where the mosquitoes have no preference for domestic animals, the maxillary index, namely, the average number of teeth on each maxilla, is generally below 14, and they are dangerous from the point of view of malaria. Where the preference for domestic animals is marked, the maxillary index is above 14. This has been borne out by the study of a large number of specimens from various regions. When the competition between mosquitoes for animal hosts is slight, the maxillary index is not above 15, but when competition is very great, it rises to 17 or above. An excessively high index indicates a shortage of animal hosts, when man may again be attacked.

A two-page list of references to the literature is included.

Bionomics of the Tabanidae (Diptera) of the Canadian prairie, A. E. CAMERON (*Bul. Ent. Research, 17 (1926), No. 1, pp. 1–42, pls. 5, figs. 18*).—An extended account of studies conducted in Saskatchewan, Canada, particular attention being given to 19 species, representing 4 genera, of which 1 species is new, namely, *Trichopria (Trichopria) tabanivora.*

A preliminary note on the occurrence of a head and throat bot in the wild deer (Cervus virginianus) of Minnesota, C. P. FITCH (*Cornell Vet., 18 (1928), No. 4, pp. 353–357, fig. 1*).—In this contribution from the Minnesota Experiment Station the author records cases of parasitism of the deer in that State by species of Cephenomyia. In several of these cases death resulted.

The distribution of blow-flies in South Africa, with special reference to those species that attack sheep, B. Smit and S. du Plessis (*Union So. Africa Dept. Agr. Bul. 13 (1927), pp. 19, figs. 4*).—The first part of this account (pp. 3–9) deals with blowfly distribution over South Africa; the second part (pp. 9, 10) with the sheep maggot flies; the third part (pp. 11–14) with the distribution of *Chrysomyia chloropyga*, *Lucilia sericata*, and *C. albiceps* over the farm of Grootfontein School of Agriculture; the fourth part (pp. 14–17) with seasonal distribution of *C. chloropyga*, *L. sericata*, and *C. albiceps* in the Karroo as indicated by data collected at the Grootfontein School of Agriculture; and the fifth part (pp. 17–19) with the time of the year during which flies attack sheep. A diagram showing the time of year when fly attack on sheep is most severe throughout the Union is included.

Fruit-fly (Ceratitis capitata): Baiting and trapping experiments, L. J. Newman (*Jour. Dept. Agr. West. Aust., 2. ser., 5 (1928), No. 2, pp. 229–234, figs. 2*).—In a comparison of the relative effectiveness on the peach of foliage poison baiting and the trapping or luring method, the latter was found to be the more effective. Foliage baiting, however, is done in half the time it takes to tend, clean, and renew the lure in the traps, and it is stated that in large areas the consequent increased cost with traps would more than offset the value of the additional 7 per cent of fruit saved by that method. Foliage baited four times gave 88 per cent of clean fruit; trapping or luring renewed four times 95 per cent; and the control only 11 per cent of clean fruit.

The foliage bait consisted of powdered arsenate of lead 2.5 oz., molasses 4 lbs., juice of 1 doz. oranges, and water to make 4 gal. The lure in the traps was made of pollard 8 oz., powdered borax 8 oz., arsenate of soda 0.25 oz., and water to make 1 gal. of liquid, the ingredients being thoroughly mixed together in the water and allowed to steep for 16 hours.

The British Tachinidae (Diptera), C. J. Wainwright (*Ent. Soc. London, Trans., 76 (1928), pt. 1, pp. 139–254, pls. 2, figs. 4*).—This account consists of an introduction, discussion of terminology, key to subfamilies and genera, genera and species, and a list of the literature cited. Two species and one variety are described as new.

A new leaf miner injurious to larkspur (Phytomyza delphiniae Frost), G. H. Griswold (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 855–857*).—This is an account of the injury caused by the larkspur leaf miner (*P. delphiniae*), both the larvae and adults of which attack the plant. The stages of the pest are described, and notes are given on its life history and habits. The hymenopterous parasites *Cyrtogaster liqueatus* Ashm. and a new species of Opius were reared from the pupae.

Hot water as an insecticide for the Japanese beetle in the roots of nursery stock, W. E. Fleming and F. E. Baker (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 818–822*).—The authors found hot water to be an effective dip for killing the eggs, larvae, prepupae, pupae, and adults of the Japanese beetle in the soil. A temperature of 112° F. is the lowest which will give dependable results within a practical period of time, and this temperature is recommended for the treatment of soil about the roots of nursery stock to destroy the soil-infesting stages of the beetle.

Soil insecticides for the Japanese beetle, W. E. Fleming (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 813–818*).—This is a brief summary of information on materials which have been tested to determine their effectiveness for destroying the Japanese beetle in the soil about the roots of nursery plants.

Some phases of the Japanese beetle insecticide investigations, E. R. Van Leeuwen, O. G. Anderson, and P. A. van der Meulen (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 805–813, pls. 2*).—Data are presented to show that certain nontoxic materials are as effective in repelling beetles as is lead arsenate, indicating that other factors besides toxicity are responsible for the repellence of the lead arsenate sprays. It was found that in cases of heavy infestation there is some doubt whether a large percentage of kill and a high degree of protection can be obtained by means of a stomach insecticide.

Progress with the imported parasites of the Japanese beetle during 1927, H. W. ALLEN and H. A. JAYNES (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 823–832, fig. 1*).—This is a progress report (E. S. R., 57, p. 862) on the work of introducing parasites of the Japanese beetle during 1927. *Centeter cinerea* increased its area of distribution, but is being imported for further colonization. *Ochromeigenia ormioides* has not yet been recovered, but recoveries were made of both *Prosena siberita* and *Dexia ventralis*. Further liberations were made of these three fly parasites. *Tiphia popilliavora* has increased rapidly from the small beginning previously reported. *T. vernalis* and *Tiphia* sp. were liberated in large numbers, but have not yet been recovered.

The paper concludes with a brief résumé of the work accomplished since 1920.

Some temperature relations of Melanotus (Coleoptera, Elateridae), B. B. FULTON (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 889–897, fig. 1*).—In this contribution from the Iowa Experiment Station the author reports that shade trees near sod ground have been found to be a common habitat for adult Melanotus wireworms. Temperature experiments show that they can not live long on the surface of sod ground on hot days, and their choice of temperature, determined in a gradient, is much below the usual maximum temperature in open fields during summer. Negative phototropism causes the beetles to seek dark hiding places during the day. The larvae of Melanotus are more resistant to heat than the adults, but do not voluntarily seek higher temperatures. Seasonal movements of wireworms may be closely correlated with soil temperature changes.

A new beneficial beetle in Massachusetts, W. D. WHITCOMB (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 937, 938*).—This is a contribution from the Massachusetts Experiment Station in which the author reports that *Cantharis andersoni* Frost, a recently determined species, has increased rapidly in the eastern part of the State since 1920. It feeds freely on most aphids common in the locality, and in cages has killed and devoured the larvae of several fruit and vegetable insect pests.

Observations on the snout-beetle, Evotus naso Lec., on apple trees at Yakima, Washington, M. A. YOTHERS (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 832–836, fig. 1*).—The author records the feeding of this snout beetle on apple buds at Yakima, Wash., this being the first record of the habit. The account includes notes on the feeding habits, oviposition, and life history.

Further studies on the evaporation of nectar, O. W. PARK (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 882–887, figs. 2*).—The author reports that further experiments (E. S. R., 58, p. 62) at the Iowa Experiment Station are in agreement with those reported the previous year. All of these indicate that nectar does not become more concentrated within the honey sac of the bee between the flower and the hive entrance, but that the observed rate of nectar concentration can be fully accounted for by evaporation in its several phases, carried on within the hive.

Disinfecting combs, G. L. JARVIS (*Jour. Econ. Ent., 21 (1928), No. 6, pp. 887–889*).—The author reports upon work at Guelph, Ontario, in which it was found that alcohol-formalin and water-formalin are not always effective for American foulbrood in cases where there are massed spores. Treatment of brood combs may mean harboring or spreading the disease. There is no danger of infection from dry supercombs. Wet supercombs that do not contain scales may be disinfected by immersing in hot water for 24 hours.

Proceedings of the Swiss Commission on Nosema Disease of Bees [trans. title] (*Landw. Jahrb. Schweiz, 42 (1928), No. 4, pp. 511–547*).—A report on the work of the Nosema Commission in 1927, by F. Leuenberger (pp. 513, 514), is followed by accounts of the control work with bee diseases, by F. Leuenberger, E. Rotschy, and E. Rossetti, respectively (pp. 514–517); Remedial Work with Nosema Disease of Bees, by O. Morgenthaler, J. Wüfler-Wyss, J. Dambach, and E. Fischer (pp. 518–531); Observations on Nosema Control Work in 1926 and 1927, by O. Schneider-Orelli (pp. 531–536); and Experience with Nosema in the Field and Laboratory in 1927, by O. Morgenthaler (pp. 536–547).

Studies on the Ichneumonidae, I, II, [trans. title], A. SEYRIG (*Eos [Madrid], 2 (1926), No. 2–3, pp. 115–133, figs. 8; 3 (1927), No. 2, pp. 201–242, figs. 12*).—In the studies here reported the author erects 1 genus and describes 14 new species and 3 varieties.

Telenomus megacephalus Ashm., an egg parasite of the green pumpkin bug, Nezara viridula Linn., in Florida, R. L. MILLER (*Fla. Ent., 12 (1928), No. 2, pp. 17–20*).—An account of studies of this parasite, its life history, and habits, the details of which are tabulated.

Notes on the biology of Telenomus fariai Lima, an egg parasite of Triatoma (trans. title), A. DA COSTA LIMA (*Mem. Inst. Oswaldo Cruz, 21 (1928), No. 1, pp. 201–218, pls. 3; Eng. abs., pp. 210–218*).—This is an account of observations of a parasite reared from the eggs of the reduviid known as the "barbeiro" or kissing bug, the principal carrier of *Schizotrypanum cruzi* Chag. This egg parasite, described by the author as *Telenomus fariai* n. sp. (E. S. R., 58, p. 562), is the only known microhymenopterous parasite of the eggs of this triatomid.

ANIMAL PRODUCTION

[Animal husbandry investigations at the Canadian experimental stations and farms] (*Canada Expt. Farms, Rpts. Supts. 1927, Agassiz (B. C.) Farm, pp. 4–17, 36–45, figs. 8; Brandon (Man.) Farm, pp. 4–20, 64–69, figs. 2; Charlottetown (P. E. I.) Sta., pp. 7–13, 53–60, fig. 1; Fredericton (N. B.) Sta., pp. 5–18, 44–59, figs. 3; Harrow (Ont.) Sta., pp. 22–24; Indian Head (Sask.) Farm, pp. 3–9, 50–53, figs. 3; Invermere (B. C.) Sta., pp. 6–10, 37–42, figs. 2; Kapuskasing (Ont.) Sta., pp. 4–15, 60–66; Kentville (N. S.) Sta., pp. 5–7, 46–49, fig. 1; Lennoxville (Que.) Sta., pp. 3–21, 63–71, figs. 2; Morden (Man.) Sta., pp. 4–8, 49–55, fig. 1; Rosthern (Sask.) Sta., pp. 3–14, 51–54, figs. 2; Scott (Sask.) Sta., pp. 5–14, 67–69; Sidney (B. C.) Sta., pp. 4–7, 59–67; Swift Current (Sask.) Sta., pp. 4, 5, 51; La Ferme (Que.) Sta. Rpt. Supt. 1926–1927, pp. 7–18, 53–65*).—In these publications (E. S. R., 59, p. 160), brief reports are given by W. H. Hicks, M. J. Tinline, J. A. Clark, C. F. Bailey, H. A. Freeman, W. H. Gibson, R. G. Newton, S. Ballantyne, W. S. Blair, J. A. McClary, W. R. Leslie, W. A. Munro, V. Matthews, E. M. Straight, J. G. Taggart, and P. Fortier, respectively, on the results of feeding and breeding experiments with horses, beef and dairy cattle, sheep, swine, and poultry.

Report of the animal husbandry division, G. B. ROTHWELL (*Canada Expt. Farms, Anim. Husb. Div. Rpt. 1927, pp. 93, figs. 12*).—Brief results of experimental work at the Central Experimental Farm with beef and dairy cattle, horses, swine, and sheep, together with progress reports on animal hybridization at Buffalo Park, Wainwright, Alta., are given for the year ended March 31, 1927 (E. S. R., 58, p. 565).

The conversion of dry roughage into a succulent feed: An examination of the Sugar Jack process (*Canada Dept. Agr. Bul. 96, n. ser. (1927), pp. 38,* *figs. 2*).—A report of experiments by the divisions of animal husbandry, chemistry, and bacteriology of the Central Experimental Farm, Ottawa, with the Sugar Jack process for converting dry roughages into succulent feed. This process consists of feeding coarse roughage into the top of a silo-like tank and moistening evenly with a converter dissolved in water. The converter is a vegetable and mineral compound which when dissolved in water is chemically similar to saliva and gastric and pancreatic juices. The roughage digests so readily in the tank that the temperature rises to from 130 to 185° F. The process is a continuous one, since the digested material is removed from the bottom of the tank and replaced by dry roughage and more converter at the top.

In feeding dairy cows this processed feed, the animal husbandry division found that while the Sugar Jack rations contained more nutrients than a ration using corn silage, the latter feed produced more milk. Sugar Jack feeds were less palatable, less digestible, and in practically all respects inferior to corn silage as a feed for dairy cows. The chemistry division found that in passing through this process roughages lost approximately 20 per cent of their protein and 12 per cent of their carbohydrate content. On the other hand, the process did make it possible to feed coarse roughages in a more edible condition. The bacteriology division found that the chief loss of food material resulted from the acid fermentation of the carbohydrates, and that there was also a loss of nitrogen through decomposition. The final stages of fermentation in this process tended toward ammoniacal decomposition and therefore uneconomical fermentation. These facts, together with the increased cost of the processed feeds as compared with regularly ensiled roughages, indicate that the Sugar Jack process for converting dry roughages into succulent feeds is not an economical or practical procedure.

A history of Aberdeen-Angus cattle, A. H. SANDERS (*Chicago: New Breeder's Gaz., 1928, pp. XX+1042, pls. 105*).—An interesting and comprehensive treatise on the origin and development of the Aberdeen-Angus breed of cattle, their introduction, progress, and future possibilities in the United States.

The value of home grown foods as partial or complete substitutes for maize meal in the rations for fattening pigs (*Cork Co.* [*Irish Free State*] *Com. Agr. Ann. Rpt. 1927, pp. 17–25*).—A series of pig feeding tests was conducted by the County of Cork committee of agriculture to determine the value of crushed oats as a partial substitute for corn meal in a ration for fattening pigs and the value of a mixture of equal parts of crushed oats and barley as compared with corn meal. The pigs at each feeding station were divided into uniform groups fed similar amounts of grain and a protein supplement, such as wheat bran, fish meal, or separated milk. The various tests were of from 88 to 93 days' duration. The meal mixtures were soaked for about 12 hours before feeding.

Adding soaked crushed oats to the ration increased the rate and decreased the cost of gains as compared with corn meal and bran alone. It was found that crushed oats could with advantage make up one-half of the meal ration, although definite conclusions could not be drawn. There was sufficient evidence to show that finely ground barley of good quality could be used to advantage to replace the corn meal in a fattening ration.

Horse breeding in Hungary, H. VON BREDOW (*Die Pferdezucht in Ungarn. Hannover: M. & H. Schaper, 1927, pp.* [*4*]+*119*+[*17*], *figs. 17*).—An interesting history of the development of the horse industry at the various Government breeding farms, at private studs, and by the remount service in Hungary.

Stable wise, S. G. GOLDSCHMIDT (*New York: Charles Scribners Sons, 1929, pp. XVI+17–176, pl. 1, figs. 74*).—A practical treatise divided into the following sections: The stabled horse; the new purchase; feeding and exercise; grooming, trimming, and clipping; shoeing, simple ailments; summering hunters and wintering polo ponies; saddlery and equipment; stables and their designs; and duties of owners and grooms.

[Poultry investigations at the Dominion experimental farms, 1926 and 1927], F. C. Elford (*Canada Expt. Farms, Poultry Div. Rpts. 1926, pp. 61, figs. 15; 1927, pp. 57, figs. 10*).—The usual reports of the Dominion poultry husbandman (E. S. R., 56, p. 468), giving the results and progress reports of investigations being conducted at the several stations and farms.

The absorption rate of the reserve yolk in baby chicks, S. J. Schilling and W. L. Bleecker (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 5, pp. 618–626, figs. 3*).—In work conducted at the Arkansas Experiment Station wide differences were observed in the individual rates of utilization of the reserve yolk, though unaccompanied by observed pathological changes or bacterial interference. The level of intake of feed was not found to influence the rate of disappearance of yolk. Chicks making the better gains did not necessarily digest and absorb their reserve yolk more rapidly; the converse also was true. Up to the fifth day, considerable masses of unabsorbed yolk may usually be found, and an infectious or other pathological state is not predicted even on the presence of yolk masses weighing up to 4 gm. on the seventh to ninth days.

Does a mixed grain ration meet the vitamin-B requirements of chicks brooded on wire? R. M. Bethke and D. C. Kennard (*Poultry Sci., 7 (1928), No. 6, pp. 287–292*).—In studies at the Ohio Experiment Station, 6 lots of 25 day-old chicks each were fed rations containing 63 per cent or more of ground whole grains, 10 per cent of other seed products, 20 per cent of either meat scraps or dried buttermilk, and adequate mineral and fat-soluble vitamin supplement for 10 weeks in pens floored with 0.5 in. mesh wire. None of the lots were exposed to direct sunlight. Dried brewer's yeast and autoclaved yeast were used to supply both the antineuritic and growth-promoting factors required by growing chicks. Such rations were found to meet the vitamin-B requirement of chicks kept under the above conditions.

A study of the first year egg production of S. C. Rhode Island Reds, V. S. Asmundson (*Sci. Agr., 8 (1927), No. 3, pp. 141–150, figs. 3*).—A study based on the trap-nest records of 510 Rhode Island Red March-, April-, and May-hatched pullets at the University of British Columbia, Canada, from 1920 to 1925, inclusive. The birds were fed and handled under practically the same conditions each year, and only eggs laid from November 1 to October 31, inclusive, were considered. The birds were selected to some extent each year, but the culling was not complete since it was deemed advisable to retain at least 100 birds for the test.

The annual egg production increased from 160.98±2.7 eggs in 1920–21 to 209.13±3.08 eggs in 1925–26. The mean annual egg production of all birds during the 6 years was 191.06±1.34 eggs. During the test the proportion of birds laying 225 eggs or more increased from 7.7 to 40.6 per cent, while the proportion laying less than 150 eggs decreased from 30.8 to 8.9 per cent. The proportion of eggs laid in any season changed but slightly, although the number laid per season increased markedly. The peak of production occurred in April, and the lowest production was in November. There was only a slight change during the 6 years in the variability of annual production, and the variation in monthly production was least during March, April, and May and highest at the beginning and end of the laying year.

Second year egg production in relation to first year egg production in the domestic fowl, M. A. Jull (*Poultry Sci., 7 (1928), No. 6, pp. 276–286,* *figs. 2*).—An analysis of the records of the Vineland, N. J., International Egg-Laying Contest and of the flocks of several experiment stations was made by the U. S. D. A. Bureau of Animal Industry in an endeavor to correlate second year with first year egg production. The records of birds of several breeds were divided into three classes according to first year production, namely, 0 to 100 eggs, 101 to 201 eggs, and 202 to 302 eggs.

The results show that in the case of low first year producers more than half as many eggs were laid during the second year; with the medium first year producers approximately 42 to 45 per cent were laid the second year; and with the high first year producers approximately 35 to 41 per cent were laid the second year. These results led the author to believe that the standard of 180 eggs for second year production in his proposed Record of Performance (E. S. R., 50, p. 569) is too high.

Construction of score card for judging for egg-production, R. M. Sherwood and C. B. Godbey (*Poultry Sci., 7* (*1928*), *No. 6, pp. 263–274*).—The characters, weight, color of shank, handling quality, capacity, molt, length and width of back, depth of body in front, and egg production were studied at the Texas Experiment Station in an effort to determine the relative value to assign to each when judging for annual egg production. Two samples of Single Comb White Leghorns in their first laying year were used. The first sample, consisting of 96 pullets, was of similar blood lines, while the second sample consisted of 100 birds whose dams were of like breeding but sired by cockerels of different breeding.

It was found that the variation in the constants of these characters was so great that a score card which could be used for one sample was unpractical for the other. Experimental errors and rather crude methods of measuring some of the characters were not accounted for in the study, nor was it learned to what extent curvilinear relations existed. The authors conclude that more refined methods must be used before a score card can be made that will have any range of applicability.

The death rate of three standard breeds of fowl during the pullet year, F. J. Dudley (*Poultry Sci., 7* (*1928*), *No. 6, pp. 245–253, figs. 2*).—An analysis of the records of the Harper Adams Agricultural College laying trials over a period of 15 years was made to obtain data on the death rate of pullets of three breeds. The records cover a period of 11 calendar months each year from November to September, inclusive. The breeds studied were the White Leghorn, White Wyandotte, and Rhode Island Red. No significant difference in the death rates during the pullet year of these breeds was evident in the study.

Growth and the relation between live weight and feed consumption in the case of White Pekin ducklings, H. W. Titus (*Poultry Sci., 7* (*1928*), *No. 6, pp. 254–262, figs. 3*).—In this study by the U. S. D. A. Bureau of Animal Industry, the curve of diminishing increment was fitted to the data obtained by Horton (E. S. R., 58, p. 570) on the growth and feed consumption of White Pekin ducklings from the third to the eleventh week of age. It was found that the law of diminishing increment expressed the relation between live weight and feed consumption. The relation between age and live weight was expressed by Robertson's modification (E. S. R., 50, p. 569) of the equation describing the course of an autocatalytic monomolecular chemical reaction.

Successful turkey raising, A. W. Johnson (*Scandia, Minn.: V. R. Gabrielson, 1928, pp. 29, figs. 5*).—A practical pamphlet giving details for the selection, housing, breeding, feeding, management, and marketing of turkeys.

Studies on the wool production of Angora rabbits, J. N. Pickard (*Harper Adams Utility Poultry Jour., 14* (*1928–29*), *No. 1, pp. 8–16, figs. 2*).—In this experiment at the University of Edinburgh, Scotland, various factors that may affect the growth of wool of Angora rabbits have been studied. A considerable variation was found in the seasonal production for Angora bucks, being heaviest from September to December and lowest in the late spring and early summer. With young rabbits the amount of wool produced increased gradually to about eight months of age, but after this time age had little influence on the amount of wool produced. "Furnishings" (tufts of wool on the tips of the ears and heavy wool growth on feet and legs) were correlated with a high yield. It was found that small rabbits produced more wool per ounce of live weight than did large animals. Although the data do not warrant a definite conclusion, the author suggests that rabbits born in April produce more wool the first year than do those born in other months.

DAIRY FARMING—DAIRYING

An experiment in the free-choice feeding of mineral supplements to dairy cattle, W. B. Nevens (*Illinois Sta. Bul. 316 (1928), pp. 117–124*).—This study, extending over parts of four years, was designed to determine whether dairy cattle kept under ordinary herd conditions in barn and dry lot would voluntarily supplement their rations with minerals offered in a self-feeder. Cows of from moderate to good productivity and their daughters forming a "heifer group" were confined in barns and dry lot throughout the test. The ration used consisted of corn silage, legume hay, and a grain mixture. The minerals were offered in boxes in the exercising yards except during that period of the year when bad weather prevented cows from being turned out. During the first two years, finely ground limestone and common salt were placed in separate compartments. The third year bone meal was added in a third compartment, and both this product and the ground limestone were mixed with salt at the rate of 4 parts to 1 part of salt. When no supplement was fed in the yard, bone meal and salt were incorporated in the grain mixture at the rate of 1.5 per cent each, and while supplements were fed 1 per cent of salt was added to the grain mixture.

It was found that 1 per cent of salt in the ration was insufficient to satisfy the craving of dairy cattle, and when allowed access to salt in a self-feeder they consumed rather large quantities in addition. No particular desire for the other supplements was manifested, only insignificant amounts of ground limestone and bone meal being consumed when offered free choice. The test showed that either the ration fed contained enough calcium and phosphorus to prevent deficiencies in these elements or that the ground limestone and bone meal were so unpalatable that the cattle refused to eat them even to satisfy a craving.

The influence of supplementary summer feeding on dairy cows [trans. title], B. V. Larinov (*Zap. Leningrad. Selsk. Khoz. Inst.* (*Mém. Inst. Agron. Léningrade*), *4* (*1927*), *pp. 703–714*, *figs. 2*).—At the Leningrad Agricultural Institute, 5 lots of 2 cows each were fed for 6 weeks to determine the value of certain concentrates as supplements to pasture. The concentrates fed were cracked oats, millet, barley, wheat bran, and linseed cake. Such factors as time of last calving, time of breeding, and length of lactation were used for correcting the data. The amount of milk produced at each milking and its fat content, and specific gravity were recorded.

It was found that the effective quantity of supplementary concentrates for cows on pasture of average quality was equal to one-fourth the starch equivalent necessary to maintain live weight and milk production. Observations showed that linseed cake and bran tended to scour the animal slightly, that oats and barley had a more regulating effect on the condition of the feces, and that millet was an excellent dietary remedy for cattle on pasture, regulating digestion and thereby increasing milk production. The author recommends the concentrates in the order of their effectiveness as follows: Millet, oats, linseed cake, bran, and barley.

Better winter feeding and use of forage crops [for dairy cows] (*Cork Co. [Irish Free State] Com. Agr. Ann. Rpt. 1927, pp. 31–43*).—The first part of this article by the County of Cork committee of agriculture deals with a comparison of 2 lots of 7 cows each fed during the winter on hay or straw and roots. In addition the cows in 1 lot received an average allowance of 4.7 lbs. of concentrates per day. The chief advantages found for feeding concentrates during the winter were increases in butterfat production and the heavier, healthier, more thrifty calves produced.

The use of forage crops as reported in the second part of this article showed that the addition of green rye to the ration during the late spring resulted in an increase in milk production sufficient to pay for the cost of the crop. Although in 4 trials vetches did not increase milk production, the seasonal decline in yields was markedly checked. Other advantages resulting from the use of vetches were the increased stock-carrying capacity of a given area and the early grazing made possible by the use of such crops.

Hand-rearing of dairy calves, A. F. Wande (*Union So. Africa Dept. Agr. Bul. 39 (1928), pp. 20, figs. 19*).—The results of two experiments at the Potchefstroom Experiment Station in an endeavor to develop a method by means of which calves could be satisfactorily reared on a small quantity of whole milk supplemented with concentrates and roughages are reported.

In the first test the calves were full fed whole milk for 4 weeks and the amount then gradually diminished until they were weaned at 9 weeks of age. A grain mixture of maize meal, bran, peanut meal (2 : 1 : 1), 2 per cent salt, and 1 per cent bone meal, and alfalfa hay were gradually introduced into the feeding schedule. When 3 months old the calves were turned on pasture. During the 183 days of the test the calves increased from an average initial weight of 93.3 lbs. to an average final weight of 304.6 lbs. The calves made satisfactory growth, developed well, and the system followed proved economical.

The calves in the second test were also fed whole milk for 4 weeks, gradually changed to skim milk, and a grain mixture of maize meal, crushed monkey nuts (2 : 1), salt 2 per cent, and bone meal 1 per cent, and teff hay gradually introduced. These calves were also turned on pasture at 3 months of age. During the 176 days of the experiment the calves increased from an average initial weight of 92.5 lbs. to an average final weight of 330 lbs. This system of feeding was satisfactory from the viewpoint of growth and development, but with the high price of the monkey nuts the fat supplied from this source was not as economical as the butterfat of whole milk.

Seventeenth annual report of the International Association of Dairy and Milk Inspectors, compiled by I. C. Weld (*Internatl. Assoc. Dairy and Milk Insp. Ann. Rpt., 17 (1928), pp. 300, pl. 1, figs. 5*).—The usual report of the annual meeting (E. S. R., 58, p. 672) held at Chicago, Ill., October 11–13, 1928, includes the following papers:

The Goal of Dairy and Milk Inspectors, by I. V. Hiscock (pp. 41–49); Report of Committee on Dairy and Milk Plant Equipment, by G. W. Putnam (pp. 50–56); Report of Committee on Methods of Bacterial Analysis of Milk and Milk Products, by G. E. Bolling (pp. 57–62); The Influence of the Individual Cow on the Bacterial Content of Milk, by J. W. Yates (pp. 63–69); The Care of

Milking Machines at Market Milk Dairies, by F. D. Holford (pp. 70–79); Report of Committee on Milk Plant Practice, by H. A. Harding (pp. 80–89); A National Cooperative Campaign for Clean and Safe Milk, by S. J. Crumbine and C. F. Chrisman (pp. 97–119); Report of Committee on Food Value of Milk and Milk Products, by P. B. Brooks (pp. 120–126); Report of Committee on Serving Milk in Schools, Factories, and Office Buildings, by M. O. Maughan (pp. 127–135); The U. S. Public Health Service Milk Control Plan, by L. C. Frank (pp. 136–141); Results of Milk Control Work during the Past Five Years in Alabama, by C. A. Abele (pp. 142–159); Ye Lowly Thermometer, by R. M. Washburn (pp. 160–167); Reports of Delegates to World's Dairy Congress, I, by P. B. Brooks (pp. 168–173); II, by T. Holt (pp. 174–181); Milk Grades, by W. F. Fox and J. L. Pomeroy (pp. 182–203); Report of Committee on Milk Ordinances, by W. B. Palmer (pp. 204–206); Report of Committee on Sanitary Control of Ice Cream, by R. E. Irwin (pp. 207–216); Improvement of Pasteurization Plants and Their Milk Supplies in Kentucky, by S. V. Dugan (pp. 217–228); Report of Committee on Educational Aspects of Dairy and Milk Inspection, by C. L. Roadhouse (pp. 229–232); Report of Committee on Bovine Diseases: Their Relation to the Milk Supply and to the Public Health, by C. D. Pearce (pp. 233–237); The Economic Advantage of Abortion Control, by J. P. Bushong (pp. 238–243); Report of Committee on Communicable Diseases Affecting Man—Their Relation to the Milk Supply and to the Public Health, by H. R. Estes (pp. 244–255); The Distribution of Fat in Gravity Cream, by T. J. McInerney and P. F. Sharp (pp. 256–260); Some Laboratory Studies on the Sanitary Quality of Concentrated Milk, by J. H. Shrader (pp. 261–264); Powdered Milk and the Public Health, by J. A. Tobey (pp. 265–273); Approved Dairies and Some New Thoughts on Dairy Inspection Work, by R. F. Leslie (pp. 274–278); Effect of Incubation at 145° F. on Bacterial Plate Counts of Milk, by R. R. Palmer and C. T. McCutcheon (pp. 279–288); Conducting the Methylene Blue Test at 145° F., by H. A. Harding, A. R. Ward, and H. G. Harding (pp. 289–298); and Report of Committee on Score Cards and the Score Card System of Rating Dairies and Dairy Products, by C. S. Leete (pp. 299, 300).

The influence of the pH of agar media upon the bacterial counts of raw and pasteurized milk, J. FABER (*Jour. Dairy Sci., 11 (1928), No. 5, pp. 401–403*).—At the Maryland Experiment Station a study was made to find whether or not there is a material variation in bacterial counts of milk when beef extract agar is employed for plating with the following pH values: 6.2, 6.4, 6.6, 6.8, and 7. Ninety-nine samples of raw milk and 100 samples of pasteurized milk were plated on agar with the above values. Little variation was found.

A study of the "common white" yeasts found in dairy products, J. A. NELSON (*Jour. Dairy Sci., 11 (1928), No. 5, pp. 397–400*).—In order to be able to describe more fully the "common white" yeasts found in dairy products, the Montana Experiment Station studied 160 cultures isolated from cream, butter, soft cheese, milk, and other minor sources. On the basis of morphology, growth temperatures, and the action of litmus milk, the author concluded that the organisms naturally divided into four types.

The action of these yeasts was slow, and from their general behavior the author believes that they have little influence on changes produced in dairy products by microorganisms.

Destruction of botulism toxin by milk bacteria, J. M. SHERMAN and C. N. and P. STARK (*Jour. Dairy Sci., 11 (1928), No. 5, pp. 352–358*).—Studies at the New York Cornell Experiment Station have shown that certain bacteria commonly found in milk, such as *Streptococcus lactis*, *Lactobacillus casei*, *Bacterium coli*, *B. communior*, *B. aerogenes*, and *Proteus vulgaris*, have the power of destroying the toxin produced by *Clostridium botulinum.* In most types of cheese *S. lactis* is the predominating organism during the early stages of ripening, and *L. casei* during the later stages of ripening in all types of cheese. The results obtained partially explain the fact that milk and dairy products are seldom, if ever, disseminating agents of botulism.

The volume of the cream layers forming on Holstein and Jersey milk, J. C. MARQUARDT and A. C. DAHLBERG (*Jour. Dairy Sci., 11 (1928), No. 5, pp. 409–419, fig. 1*).—The milk used in each test of this experiment at the New York State Experiment Station was the complete milking of one cow, which was cooled at once to approximately 50° F. As soon as cooled, 100 cc. of each sample of milk in duplicate tubes were placed in a water bath at 37 to 40°. The depth of the cream layer was measured after 2-, 4-, and 24-hour intervals. In all, 627 Holstein and 900 Jersey samples of milk were used. The majority of the Holstein samples tested from 3.1 to 3.7 per cent fat and the Jersey samples from 5 to 7 per cent fat.

After 2 and 4 hours the cream layers of the different samples showed considerable variations in volume and in distinctness of cream line. These variations were less pronounced at 24 hours. The depth of the cream layer was directly proportional to the percentage of fat. The percentage which the cream layer represented of the total volume of milk was about 4.1 times the percentage of fat. Greater variations were found in the volumes of the cream layers of Jersey milk than in those of Holstein milk, and this was especially noticeable at the 2- and 4-hour intervals. Variations were found in the creaming properties of the milk from individual cows from milking to milking. The season of the year in which the milk was produced had little influence on the cream layer volumes, and especially was the Holstein milk uniform throughout the year. The variations in specific gravity were not related to the changes in the creaming properties of milk.

A defect in milk due to light, W. C. FRAZIER (*Jour. Dairy Sci., 11 (1928), No. 5, pp. 375–379*).—A study of the cause of a "cardboard" taste in milk was made by the U. S. D. A. Bureau of Dairy Industry. Duplicate samples of milk were prepared, one of which was exposed to daylight and the other placed in the dark in a well-aerated metal container. The samples were kept in flasks or bottles stoppered with cotton or covered with paper or a sterile glass beaker, so that no off taste could come from a cardboard cap. The exposed bottles were not placed in direct sunlight, and the incubating temperature was in most cases just above freezing.

The samples kept in the light developed the characteristic cardboard taste and odor after 20 to 48 hours, of which 8 to 26 hours were daylight, but no such taste or odor developed in the milk kept in the dark even after 7 to 9 days. No off taste developed in skim milk exposed to daylight, but did develop in both whole milk and cream. The cardboard flavor developed more rapidly in pasteurized than in raw milk, and milk sterilized in the autoclave developed the flavor though somewhat less rapidly. The milk from cows fed oil meals or cakes developed the defective flavor no more rapidly than that from cows fed no oil feeds.

Surface taint butter, E. G. HOOD and A. H. WHITE (*Canada Dept. Agr. Pamphlet 91, n. ser. (1928), pp. 13*).—A study of butter graded as having surface taint, found in the Provinces of Quebec, Ontario, Manitoba, Saskatchewan, and Alberta, was made by the Canada Department of Agriculture.

All of the samples were found to be abnormally high in yeast and bacterial content, and of the bacteria there was a considerable number capable of decomposing butter curd. The acidity and curd content of most of the butters were found to correspond closely to those of normal butter. The surface taint appeared no matter what type of neutralizer was used, but on the other hand careless methods of neutralizing or overneutralizing failed to produce the surface taint. This defect also occurred in butter with a salt content of 2.67 per cent. The water supplies of the various creameries were found to introduce large numbers of undesirable organisms. By isolating certain strains of these bacteria and inoculating pasteurized and neutralized cream butter with surface taint was experimentally produced.

The authors recommend that improved sanitary methods within the plant, and especially the use of bacteriologically clean water, be used in preventing this defect of butter.

Studies on butter salts, O. F. Hunziker, W. A. Cordes, and B. H. Nissen (*Jour. Dairy Sci., 11 (1928), No. 5, pp. 333–451*).—For this test the authors selected 10 well-known butter salts, 3 being flake and 7 cube salts. Chemical, physical, and bacteriological analyses were made of each salt and the effect on flavor, body, texture, and color of butter; effect of impurities on flavor; and suitability for use in soaking parchment wrappers and liners were studied.

It was found that while some of the salts caked badly in the barrel, others were free-flowing, and the latter salts had the greatest freedom from chemical impurities and were lowest in moisture content. The presence in the salt of calcium chloride and magnesium chloride, both of which are highly deliquescent, diminished the free-flowing properties of the salt and caused lumping. The flake salts were more bulky than the cube salts. Using the weight of a given volume of water as 1, the weight of flake salts averaged 0.86 and of the cube salts 1.26. Some of the salts contained so much foreign material that when dissolved in water they produced a very turbid brine of dirty color, making them unfit for treating parchment. All the salts were bacteriologically clean. About 60 per cent of the flake salt crystals passed through 40 to 60 mesh screens and 27 per cent required a coarser screen, while 90 per cent of the cube salt crystals passed through the fine screen and only 1.7 per cent required coarser screens.

The differences in rate of solubility of the various brands and types were too slight to be of any significance. However, it was noticed that during the first 20 seconds in water the flake salts tended to go into solution somewhat more rapidly. The average sodium chloride content of the 10 salts was 99.14 per cent. The calcium sulfate content, the largest chemical impurity, ranged from 0.01 to 1.225 per cent, while small amounts of calcium and magnesium chlorides, magnesium and sodium sulfates, calcium and magnesium carbonates, and traces of iron were present. The insoluble matter ranged from 0.003 to 0.031 per cent and moisture from 0.005 to 0.14 per cent

No differences in flavor, body, texture, or color of the finished butter could be detected from the use of the various salts. Even when rather large amounts of impurities were added to the salts, no noticeable effect on flavor could be detected. The results indicate that while chemical purity is desirable, such small amounts of impurities as were found in the salts studied have no apparent effect in impairing or changing the quality of butter.

Studies on moulds and yeasts in creamery butter, E. G. Hood and A. H. White (*Canada Dept. Agr. Pamphlet 92, n. ser. (1928), pp. 15*).—The contents of this pamphlet by the Canada Department of Agriculture are divided into three parts.

The experiments reported upon in part 1 showed that large numbers of bacterial colonies grew on media with a pH value of 4.6, and that there were few colonies on media of pH 3.8. Wide differences in yeast counts were found on these media, due to the counting of bacterial colonies on the pH 4.6 media.

All bacterial growth was inhibited on media at pH 3.5, but mold and yeast counts of individual samples compared favorably at this concentration. Using wort, malt, whey, and potato as nutrient bases with a pH of 3.5, all were found equally suitable for the growth of molds and yeasts.

Part 2 is a tentative outline for a standard method of determining mold and yeast counts of creamery butter, while part 3 is a modified score card for exhibition butter.

Some observations on the consistency of cream and ice cream mixtures, G. M. Bateman and P. F. Sharp (*Jour. Dairy Sci., 11 (1928), No. 5, pp. 380–396, figs. 3*).—Continuing its investigations on the viscosity of dairy products (E. S. R., 59, p. 574), the New York Cornell Experiment Station studied the viscosity of cream and ice cream mixes to gain some idea of the reliability of the results obtained with viscometers which operate on the liquid with a single shearing force. A modified Bingham plastometer with a definite amount of cream or ice cream at a working temperature of 25° C. was used in this work, and the rate of flow under varying shearing forces was measured.

It was found that as the fat content of pasteurized cream increased the yield value and the consistency also increased. Heating cream to 73° decreased both the yield and the consistency, the latter decreasing the most. Homogenization was found to increase the yield of a sample of 34.8 per cent fat cream 3.1 times and the consistency 7.8 times. With ice cream mixes of average composition there was considerable variation in the yield value and consistency.

The authors point out some of the difficulties encountered when plastic substances are treated as viscous, and also the difficulties in relating the viscosity of ice cream mixes to their freezing properties.

The bacterial content of orange sherbet, A. C. Fay (*Jour. Dairy Sci., 11 (1928), No. 5, pp. 404–408*).—A bacterial analysis of 21 samples of orange sherbet at the Kansas Experiment Station showed that 10 per cent contained less than 200, 24 per cent less than 1,000, 57 per cent less than 5,000, 76 per cent less than 25,000, 90 per cent less than 100,000, and 10 per cent more than 100,000 bacteria per gram.

The analyses were made to show the possible value of bacterial analysis of water ices and sherbets as a means of detecting faulty plant methods, as well as a criterion of sanitary quality.

VETERINARY MEDICINE

Black's veterinary cyclopedia, edited by W. C. Miller (*New York: Macmillan Co.; London: A. & C. Black, 1928, pp. [IX]+1081, pls. 8, figs. 326*).—This is a practical encyclopedia edited in collaboration with 13 contributors.

Thirteenth and fourteenth reports of the director of veterinary education and research, I, II, A. Theiler et al. (*Union So. Africa Dept. Agr., Rpts. Dir. Vet. Ed. and Research, 13–14 (1928), pts. 1, pp. 729, pls. 128, figs. 17; 2, pp. [4]+731–1270, pls. 25, figs. 146; Sup., pls. 13*).—The contributions in the first of these reports (E. S. R., 57, p. 77) are as follows: Ecthyma Contagiosum of Sheep and Goats, by A. Theiler (pp. 7–14); The Transmission of Tickborne Diseases by the Intrajugular Injection of the Emulsified Intermediary Host Itself, by A. Theiler and P. J. du Toit (pp. 15–44); Botulism (Parabotulism) in Equines, by A. Theiler and E. M. Robinson (pp. 45–68); *Gonderia mutans* or *Theileria mutans?* by A. Theiler and H. Graf (pp. 69–106); Investigations into the Cause of Vomeersiekte in Sheep (pp. 107–153) and On the Nature of Anaplasma (pp. 155–184), both by P. J. du Toit; Gifblaar Poisoning: A Summary of Our Present Knowledge in Respect of Poisoning by *Dichapetalum* *cymosum* (pp. 185–194) and Tulp Poisoning (pp. 195–202), both by D. G. Steyn; Some Little Known South African Poisonous Plants and Their Effects on Stock, by H. H. Curson (pp. 203–229); *Lasiosiphon anthylloides* as a Poisonous Plant, by R. Alexander (pp. 231–240); Histological Studies on East Coast Fever (pp. 241–280) and Pathological Studies on Heartwater (pp. 281–305), both by W. Steck; Nagana in Zululand, by H. H. Curson (pp. 307–412); Preliminary Report on a South African Virus Disease amongst Pigs, by D. G. Steyn (pp. 413–428); Anthrax in South Africa, with Special Reference to Improved Methods of Protective Inoculation, by P. R. Viljoen, H. H. Curson, and P. J. J. Fourie (pp. 429–531); Preliminary Report on Investigations Carried out in Connection with a Calf Disease in the Marico District, with Special Reference to Paratyphoid "*B. enteritidis*" Infection, by P. R. Viljoen and G. Martinaglia (pp. 533–549); Researches into Sterility of Cows in South Africa (pp. 551–573), A Note on the Occurrence of Struma Colloides in Bovines in the Transvaal (pp. 575–579), and Vasectomy as a Method of Sterilizing Ram Lambs (pp. 581–591), all by J. Quinlan; Necrosis in Musculature and Myocard of Sheep—Pseudotuberculosis, by G. de Kock and P. J. J. Fourie (pp. 593–599); Occurrence of Onchocerca in South Africa, by G. de Kock and P. S. Snyman (pp. 601–607); Two Cases of Squamous Cell Carcinoma (Cancroid) in the Rumen of Bovines (pp. 609–612) and A Contribution to the Occurrence of Actinomycosis in Bovines, Associated (*a*) with the Peritoneal Cavity, (*b*) with the Testicles (pp. 613–619), both by G. de Kock and P. J. J. Fourie; A Case of Naturally Contracted Tuberculosis in a Goat in South Africa (pp. 621–625) and A Case of Demodectic Mange in the Goat (pp. 627–631), both by P. J. J. Fourie; Two Cases of Rhinosporidiosis in Equines, by J. Quinlan and G. de Kock (pp. 633–639); Pneumono-mykosis in a Bovine, by G. de Kock and P. J. J. Fourie (pp. 641–644); A Study of the Reticulo-endothelial System of the Sheep, by G. de Kock (pp. 645–724); and Green Liver Cell Adenoma in a Bovine, by G. de Kock and P. J. J. Fourie (pp. 725–729).

The following papers are presented in the second part: Preliminary Investigations into an Icterus of Sheep Caused by a Bacterium (Bacterial Icterus), by E. M. Robinson (pp. 731–741); The Atrio-ventricular System of the Equine Heart, by R. W. Mettam (pp. 743–752); Oesophagostomiasis in Sheep (Preliminary Note), by F. Veglia (pp. 753–797); Check List of the Worm Parasites of Domesticated Animals in South Africa, by H. O. Mönnig (pp. 799–837); New Species of Trichodectidae from South African Mammals (pp. 839–857), The Effect of Various Dipping Fluids upon the Ovigerous Females of *Psoroptes communis* var. *ovis* and Their Ova (pp. 859–879), and South African Mosquitoes (pp. 881–990), all by G. A. H. Bedford; Soil Conditions in Typical Lamsiekte and Styfsiekte Soils, as Revealed by Pot Cultures, by J. P. van Zyl (pp. 991–1037); The Relations between the Amount of Carbohydrates in the Leaves of Armoedsvlakte Grasses and the Meteorological Factors (pp. 1039-1074) and The Phosphorus Content of the Grasses of Bechuanaland in the Course of Their Development (pp. 1075–1208), both by M. Henrici; and The Sexual Cycle of Female Domesticated Mammals, by M. Kupfer (pp. 1209–1270).

The supplement to part 2 of the reports consists of colored plates which accompany the contribution by M. Kupfer.

Anthelmintics and their uses in medical and veterinary practice, R. N. Chopra and A. C. Chandler (*Baltimore: Williams & Wilkins Co., 1928, pp. XII+291, figs. 65*).—The subject is here dealt with under three section headings, (1) general considerations (pp. 1–75); (2) anthelmintics acting on parasites in the gut (pp. 77–216), with subdivisions on anthelmintics acting on (*a*) cestodes (pp. 79–107) and (*b*) nematodes (pp. 108–216); and (3) anthelmintics used against somatic parasitic infections (pp. 217–253). There are 18 chapters and a bibliography of 22 pages.

The occurrence and destruction of gossypol in cotton seed products, W. D. Gallup (*Okla. Acad. Sci. Proc.* [*Okla. Univ.*], *7* (*1927*), *pp. 182–187*).—A review of the present status of the subject, contributed from the Oklahoma Experiment Station.

Morphologic variation and the rate of growth of bacteria, A. T. Henrici (*Springfield, Ill.: Charles C. Thomas, 1928, pp. XIII+194, pls. 2, figs. 36*).—The author's investigations here presented are reported under the headings of the problem of morphologic variation of bacteria (pp. 1–16), the rate of growth of bacteria (pp. 17–45), technique (pp. 47–57), the size of the cells of *Bacillus megatherium* (pp. 59–86), the size and form of the cells of the colon bacillus (pp. 87–97), some observations of a diphtheroid bacillus (pp. 99–110), a note on spore formation (pp. 111–115), morphologic variations of the cholera vibrio (pp. 117–124), the senescent forms of the colon bacillus (pp. 125–137), and cytomorphosis in bacteria (pp. 139–149). An appendix consisting of 27 tables and a 9-page list of references to the literature are included.

A poison produced by Bacterium enteritidis and Bacterium aertrycke which is active in mice when given by mouth, S. E. Branham, L. Robey, and L. A. Day (*Jour. Infect. Diseases*, *43* (*1928*), *No. 6*, *pp. 507–515*, *figs. 3*).—"Seventeen strains of paratyphoid bacteria, isolated from foods, or rodents, or from persons infected during food-poisoning outbreaks, produced fatal infection in 100 per cent of mice to which they were fed. These strains included 7 of *B. enteritidis*, 9 of *B. aertrycke*, and 1 of *B. schottmülleri*.

"When boiled broth cultures and Berkefeld N and W filtrates of broth cultures of these strains were fed similarly to mice, a mortality of approximately 40 per cent occurred. When whole unfiltered cultures in beef heart medium are boiled or autoclaved and then fed to mice, the mortality is often from 40 to 100 per cent. Feeding autolyzed, boiled, or autoclaved suspensions of the washed bacteria had little, if any, effect. Filtrates of 24-hour cultures produced a higher mortality than those from cultures which were incubated for longer periods of time.

"In its remarkable heat stability this poison resembles the other toxic materials which have been described in the paratyphoid group, but its surprisingly long incubation period seems to separate this toxic substance quite definitely from that responsible for the violet gastrointestinal symptoms occurring in man after eating foods containing these bacteria, and from any other toxic product of these bacteria that has yet been described."

The plurality of the foot-and-mouth disease virus [trans. title], K. Trautwein (*Arch. Wiss. u. Prakt. Tierheilk.*, *56* (*1927*), *No. 6*, *pp. 505–555*; *abs. in Trop. Vet. Bul.*, *16* (*1928*), *No. 2*, *pp. 65, 66*).—In experimental work with 76 strains of the foot-and-mouth disease virus the author has found them to represent three groups, A, B, and C, the basic difference being in their antigenic properties. The serum of animals which have been infected with all three types of virus is plurivalent. A list is given of 41 references to the literature.

On the biological combat of bovine piroplasmosis due to Theileria dispar [trans. title], E. Sergent, A. Donatien, L. Parrot, and F. Lestoquard (*Compt. Rend. Acad. Sci.* [*Paris*], *187* (*1928*), *No. 8*, *pp. 433, 434*).—It is pointed out that the prevention of this affection of cattle in North Africa has been brought about by work against *Hyalomma mauritanicum*, the tick which transmits the causative organism. In this disease of the stable the tick should be controlled by eliminating the protection afforded by cracks and crevices in the walls. The equine is not susceptible to the causative organism, and the ticks may be freed from the virus by alternating the stabulation of horses and cattle.

The epidemiology of undulant (Malta) fever in Iowa.—Preliminary report, A. V. Hardy (*Pub. Health Rpts.* [*U. S.*], *43* (*1928*), *No. 38, pp. 2459–2469, fig. 1*).—It is reported that up to June 30, 1928, undulant fever in Iowa had been established in 83 cases, all but 3 having occurred since July 1, 1927. Seventy eight of these were included in an epidemiological study made by the author. In 52 of the 78 cases the evidence indicated that the infection was acquired from cattle, while in a second group of 11 cases the evidence indicated that the infection was acquired from hogs. In a third group of 4 cases there was a known possible source of the infection in both cattle and hogs. There were 15 cases in which clear evidence of the source of the infection was not obtained, although in all these cases there had been contact with cattle or hogs or the free use of raw milk.

Bovine infectious abortion (tenth report), L. F. Rettger, J. G. McAlpine, G. C. White, and R. E. Johnson (*Connecticut Storrs Sta. Bul. 153* (*1929*), *pp. 113–130; also in Jour. Amer. Vet. Med. Assoc., 74* (*1928*), *No. 1, pp. 12–27*).—This report (E. S R., 55, p. 175) deals with eradication work with 5 herds over a period of 12 years and still under way, having been extended to 75 different herds. The work has consisted essentially in the periodic application of the agglutination and complement fixation tests (or the former alone), the segregation or disposal of reactors, and the building up of negative milk-producing herds by the addition of negative heifers and cows.

The authors have found the agglutination and complement fixation tests to constitute valuable and reliable methods of determining present or very recent *Bacterium abortus* infection in cattle. The removal of all reacting animals and the safeguarding of the newly established negative herd against infection from the outside have been found to constitute a practical and feasible method of abortion eradication, as is attested by the results obtained in the investigations here reported. At least 20 of 75 herds worked with are now negative, and a number of others are expected soon to be so classed.

Studies of infectious abortion in cattle (*Connecticut Storrs Sta. Bul. 150* (*1928*), pp. *14–19, fig. 2*).—Reference is first made to the establishment and maintenance of abortion-free herds by periodic blood testing and complete segregation of nonreacting animals and disposal of reactors as reported upon in the bulletin noted above. It is pointed out that herds which had previously been operated at a loss have become paying investments as a result of the elimination of the disease. In work with the agglutination test it was found that reactions in the 1:25 and 1:50 dilutions are not necessarily of diagnostic value, and that animals whose sera react in the 1:75 dilution should be considered as doubtfuls. A comparison of the rapid method of Huddleson and Carlson (E. S. R., 57, p. 672) with the ordinary agglutination test has shown that the rapid method admits of a high degree of accuracy in the hands of a well-trained technician.

In a comparative study made of *Bacterium abortus* and *B. melitensis* (E. S. R., 59, p. 473), it was found that *B. abortus* of bovine origin utilized very little or no glucose, but *B. abortus* of porcine and human origin and *B. melitensis* consumed from 4 to 18 per cent of the available carbohydrate for growth energy. Because of this difference in sugar metabolism *B. abortus* (bovine) can be differentiated from *B. abortus* (human and porcine) and from *B. melitensis* by the different amounts of the various nitrogen fractions present in the culture medium over a 14-day incubation period. This difference is apparent only in glucose-containing mediums.

Quantitative sugar determinations made by the Somogyi and Benedict methods, and pH determinations according to the colorimetric method of Clark, when Fairchild's peptone is employed in the medium, show that the *B. abortus-melitensis* group may be split into two main groups. The first of these includes the bulk of strains of bovine origin; none of these utilized more than 2 per cent of the available glucose. The second group includes those which utilize from 5 to 20 per cent of the available carbohydrate and is made up of *B. abortus* of human and porcine origin and *B. melitensis*. The results were consistent with a large number of strains, with the single exception of a bovine strain which showed from 8 to 10 per cent utilization. All of the human strains were apparently more closely related to the porcine strains than they were to those of bovine origin:

By the addition of from 5 to 10 per cent of carbon dioxide to bell jars containing inoculated plates it was found that the growth of the bovine strains of *B. abortus* which had been acclimated to aerobic conditions was markedly accelerated. On the other hand, this amount of the gas had a more or less inhibitory action on *B. abortus* strains of porcine and human origin and on *B. melitensis*. These results were apparently not due to changes in the H-ion concentration of the media. Total exclusion of carbon dioxide rendered the members of the abortus-melitensis group inert and unable to proliferate.

The authors were able further to substantiate this grouping by the use of two surface depressants, sodium oleate and sodium ricinoleate. It was found that in a solution whose surface tension has been reduced below 40 dynes by sodium oleate the growth of *B. abortus* (bovine) is markedly inhibited, while the human, porcine, and *B. melitensis* strains grow as luxuriantly or better than the control. The work on the sodium ricinoleate is still in progress and a similar differentiation between the two types has been found apparent, but this soap is more toxic.

In the course of the study of the transmission of *B. abortus* infection in man, 10,102 human sera were tested by the agglutination reaction, 64 of which gave a complete positive reaction in the 1:100 dilution. While the data from questionnaires have not been completely summarized, it appears that unless a serum reacts in dilutions of 1:300 or better it is very unlikely that the patient is infected with *B. abortus*. In all of the large number of strains of *B. abortus* from human sources that have been examined, the metabolic activities resemble those of porcine *B. abortus* or *B. melitensis*, the true bovine *B. abortus* having in no case been found. In three instances strains of undoubted bovine origin have given all the characteristics of the porcine strains of *B. abortus* or *B. melitensis*. Thus it seems probable that cows are sometimes infected with porcine strains.

Bovine infectious abortion (eleventh report), G. C. WHITE, R. E. JOHNSON, L. F. RETTGER, and J. G. MCALPINE (*Connecticut Storrs Sta. Bul. 154 (1929), pp. 131–147, fig. 1*).—This is a report of the results obtained in connection with the investigations above noted as related to the Connecticut Agricultural College herd of 115 head, of which 55 are milch cows and the remainder young stock and bulls. Commencing in 1923, when work looking to the establishment of an abortion-free herd was begun, maturing heifers were protected by the removal of calves at 6 months of age from both abortion-reacting and nonreacting dams to separate premises 0.5 mile distant from the main herd. The following year the policy was adopted of removing all the aborting cows from the herd, and in February and March of 1925 the 15 remaining reactors were removed from the herd and segregated. In July, 1925, 1 of the supposed clean young cows reacted, was promptly removed, and aborted 2 months later, since which time not a single animal has reacted to the blood test except young calves from the segregated reacting cows. This outstanding success in so completely removing the foci of infection in the initial separation is considered as undoubtedly promoted by the process of stabilization or delimitation of the disease through the preliminary measures employed.

The abortion rate (premature calvings prior to the two-hundred-and-sixty-fifth day of gestation), which had varied in intensity during the years from 1904 to 1924, averaging 19.5 for each 100 calvings during this time, dropped to 2.9 per cent in 1925. It was 6.1 per cent in 1926, and 0 in 1927. The average premature calving rate during the last 3 years was 3.1 per cent, this figure being substantially the same as that previously reported by the authors from over 500 calvings of nonreacting cows. The number of cows calving in each calendar year, which averaged 80.5 for each 100 cows from 1904 to 1924, was 87.4 in 1925, 100 in 1926, and 91.8 in 1927.

The milk yield of the nonreacting herd has averaged 1,505 lbs. more of 4 per cent testing milk per cow per 12-month year than the previous herd, which contained both reacting and nonreacting cows. During the last 4 years the average yield of the herd has been 10,530 lbs. of 4 per cent milk, while for 9 years prior to that the average was 9,025 lbs.

Bovine infectious abortion: Increased productivity of an abortion-free dairy herd, G. C. White, R. E. Johnson, L. F. Rettger, and J. G. McAlpine (*Jour. Dairy Sci., 11 (1928), No. 5, pp. 359–374, fig. 1*).—This account includes much of the data presented in the bulletin above noted.

Biochemical modification of cultures of B. abortus [trans. title], E. Burnet (*Compt. Rend. Acad. Sci.* [*Paris*], *187* (*1928*), *No. 15, pp. 618–620*).—The author has found that a strain of *Brucella abortus* obtained from a case of infectious abortion, modified by the prolonged action of successive cultures in media containing bile or iodoform, lost a large part of its virulence for the guinea pig and, judging from laboratory experience, even for the goat.

On the causative organism of paratubercular enteritis of bovines [trans. title], A. Boquet (*Ann. Inst. Pasteur, 42 (1928), No. 5, pp. 495–528, figs. 5*).—The author deals with the morphological, tinctorial, and cultural characteristics of Johne's bacillus; experimental inoculation and pathogenic properties; toxicity; antigenic properties in vivo and in vitro; and reactional, sensitization, and immunizing properties. A bibliography of 51 titles is included.

The intradermal tuberculin test in cattle: Collected results of experience, J. B. Buxton and A. S. MacNalty (*[Gt. Brit.] Med. Research Council, Spec. Rpt. Ser. No. 122 (1928), pp. 64, figs. 4*).—This is a second report (E. S. R., 53, p. 679) of the tuberculin committee on tuberculin tests in cattle, with special reference to the intradermal test. It is based upon the collected results of experience as obtained through a questionnaire contributed to by 77 veterinarians. Following a brief introduction, an analysis is given of replies to the questionnaire (pp. 10–38), followed by a review of the replies (pp. 38–58), arranged under 11 headings. Two appendixes are included, (1) consisting of a memorandum by the tuberculin committee on the method for carrying out the double intradermal tuberculin test in cattle (pp. 59–63), and (2) A Note on the Potency of Tuberculin, by J. B. Buxton (pp. 63, 64).

The conclusions of the committee on the subject of the intradermal test are that it is reliable for the detection of tuberculosis in cattle, this view having been confirmed by the results of post-mortem examinations of tested animals. Thus, of 835 animals which had shown no reaction to the subcutaneous test 122 reacted to the double intradermal test, and 94 of these reactors proved tuberculous at autopsy, the remaining 28 not having been examined. The vast majority of the veterinarians who have had experience with this test regard it as much more trustworthy in its results and much easier to conduct than the subcutaneous test. It is pointed out that a certain percentage of doubtful reactors may occur with this test, due either to the fact that (1) the examining veterinarian laid too much stress upon the question of measurements of the skin fold of the resultant swelling and paid insufficient attention to the deciding clinical factors, pain, heat, soft edema, and tenderness at the site of inoculation, or (2) the alleged "doubtful" cases were in animals suffering from extensive or chronic advanced tuberculosis which would not react to any form of tuberculin test.

It is considered desirable at present to retain measurements of the skin fold in the conduct of the test, and important to retain the "double" nature of the test, namely, a sensitizing dose and a subsequent dose. The suggestion is made that an increased strength of tuberculin be employed, not by increasing the bulk of the dose (0.1 cc.) but by using a specially potent form of tuberculin. In order to obtain consistent results, it is recommended that a standardized tuberculin be used in testing herds for graded milk production.

It was found to be the opinion of most veterinarians that the ophthalmic test is unreliable, and the committee suggests that its use in conjunction with the double intradermal test should no longer be prescribed.

The evidence reviewed suggests that the double intradermal test may be applied at any time, and that it is comparatively little influenced by the previous application of other methods of testing.

An enzootic pneumonia of the sheep due to Bacillus pyogenes [trans. title], L. Cominotti (*Clin. Vet. [Milan], 51, (1928), No. 8, pp. 467–472, fig. 1*).—The author reports upon the occurrence in the Alpine region of Italy of an affection due to *B. pyogenes* and enzootic in nature which occurs in acute and subacute forms.

Studies of the hog cholera bacilli [trans. title], T. Hayashi (*Ztschr. Immunitatsf. u. Expt. Ther., 54 (1927), No. 1, pp. 41–80*).—The author reports upon studies of 62 strains of so-called hog cholera bacilli isolated from cases of swine pest or hog cholera or from meat poisoning or typhoid in man in America, England, Germany, Austria, Japan, and Taiwan. The sources of the strains are listed, followed by a detailed report of studies of agglutination, agglutinin absorption, variation, relation to other bacteria, strains listed by occurrence, and pathogenicity.

The causation of creeping eruption, G. F. White and W. E. Dove (*Jour. Amer. Med. Assoc., 90 (1928), No. 21, pp. 1701–1704, figs. 7*).—It is pointed out that there are a number of creeping eruptions or skin lesions caused by animal parasites. The authors retain the name "creeping eruption" as used specifically for the disease caused by a third-stage larva of one of the dog and cat hookworms, *Ancylostoma braziliense*, a detailed account of studies of which is here presented.

Experimental creeping eruption from a cat and dog hookworm (A. braziliense), B. Shelmire (*Jour. Amer. Med. Assoc., 91 (1928), No. 13, pp. 938–944, figs. 7*).—This is a report of experiments conducted which, together with clinical evidence, corroborated the findings of White and Dove that *Ancylostoma braziliense* is the cause of creeping eruption, as above noted.

Diseases of pigeons and poultry, J. Lahaye (*Maladies des Pigeons et des Poules. Remouchamps: Steinmetz-Haenen, 1928, pp. [6]+393, figs. 115*).—This is a handbook of the important diseases and parasites attacking poultry.

The present status of our knowledge of poultry parasitism, E. B. Cram (*North Amer. Vet., 9 (1928), No. 11, pp. 43–51*).—This is a practical summary of information presented in connection with 39 references to the literature.

Manson's eyeworm of poultry, D. A. Sanders (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 5, pp. 568–584, figs. 3*).—This is a contribution from the Florida Experiment Station in which a detailed account is given of the studies which have been noted from other sources (E. S. R., 57, p. 381; 60, p. 175).

The experimental work has shown that several wild birds are capable of becoming infested and may spread infested droppings, namely, the blackbird (*Agelaius phoeniceus phoeniceus*), the bobolink (*Dolichonyx oryzivorus*), the loggerhead shrike (*Lanius ludovicianus ludovicianus*), the Florida jay (*Aphelocoma cyanea*), and the pigeon.

The author found the most effective treatment for the destruction of the worms in the eye to consist in anesthetizing the eye with a 5 per cent solution of butyn, and then lifting the nictitating membrane and placing one or two drops of a 5 per cent solution of creolin directly on the worms. The eye should be irrigated with water immediately after instilling the creolin.

A new malarial parasite of birds [trans. title], ED. and ET. SERGENT and A. CATANEI (*Compt. Rend. Acad. Sci.* [*Paris*], *186* (*1928*), *No. 12, pp. 809–811*).—Under the name *Plasmodium rouxi* the author describes a new species which has been found to occur in canaries raised in Algeria.

Neuritis or paralysis in chickens, L. P. DOYLE (*Jour. Amer. Vet. Med. Assoc., 72* (*1928*), *No. 5, pp. 585–587*).—This contribution from the Indiana Experiment Station deals with the symptoms, gross pathology, microscopic pathology, cause, and transmission of the disease.

Effect of bacillary white diarrhea infection on egg production, V. S. ASMUNDSON and J. BIELY (*Poultry Sci., 7* (*1928*), *No. 6, pp. 293–299, fig. 1*).—The results reported in this article from the University of British Columbia, Canada, are based on the data obtained from the egg records of 358 pullets of 6 breeds kept under similar conditions. These pullets had not been culled, and 16.2 per cent reacted to the agglutination test for bacillary white diarrhea.

The difference in egg production in favor of the nonreactors was 53.43 ± 5.34 eggs, a statistically significant difference. When the birds were divided into classes according to egg production, it was found that 36.2 per cent of the reactors and 7 per cent of the nonreactors laid 149 eggs or less; 48.3 per cent of the reactors and 39 per cent of the nonreactors laid from 150 to 224 eggs; and 15.5 per cent of the reactors and 54 per cent of the nonreactors laid 225 eggs or more. The variation in egg production was somewhat greater with the reactors than with the nonreactors, as indicated by the standard deviation of 10.58 ± 3.78 eggs and the coefficient of variation of 13.1 ± 2.46 per cent. The first year egg production for the reactors ranged from 9 to 283 eggs and for the nonreactors from 4 to 305 eggs. This variability in egg production indicates that culling low-producing birds would not eliminate from an infected flock all of the bacillary white diarrhea reactors.

Sanitary measures for the control of bacillary white diarrhea, R. A. CRAIG (*Jour. Amer. Vet. Med. Assoc., 72* (*1928*), *No. 5, pp. 588–593*).—This contribution from the Indiana Experiment Station deals with the subject under the headings of importance, transmission, the blood-serum or agglutination test, control measures, flock testing in Indiana, and laboratory service.

A comparative study of the intradermal tests and the agglutination method for white diarrhea (*Connecticut Storrs Sta. Bul. 150* (*1928*), *pp. 27, 28*).—In a comparison of approximately 40 positive and 40 negative birds submitted to a large number of agglutination tests and injected twice with a commercial pullorin, the two tests failed to check with a desirable degree of accuracy. Antigens used in the agglutination test containing formalin proved useless, but an antigen containing sodium hydroxide, as described by Mathews (E. S. R., 55, p. 275) prevented the formation of cloudy precipitates and checked very closely with the ordinary carbolized antigen. It appears, however, that the sodium hydroxide antigen is slightly more sensitive than any which has been tried.

On the accuracy of the agglutination test for Bacterium pullorum infection as shown by repeated tests on the same birds, I. E. Newson, F. Cross, and O. C. Ufford (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 5, pp. 611–617*).—In work at the Colorado Experiment Station it was found that after allowing for errors of reading, marking, and copying there were still inconsistencies in repeated agglutination tests on the same hens which appeared to be due to the variation in the agglutinin content of the blood. Some hens carrying *B. pullorum* failed to react at a dilution of 1 to 60. It is pointed out, however, that these findings should not in the light of present knowledge lead to the abandonment of the test as a means of eradication, but to a frank recognition of its deficiencies. The authors suggest the application of the test at more frequent intervals, in order to detect all of the carrier birds.

Atypical Salmonella pullorum agglutinations caused by bacterial contaminations, W. R. Hinshaw and G. L. Dunlap (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 5, pp. 594–598*).—In studies made over a period of two years by the authors at the Kansas Experiment Station of the causes of atypical agglutinations that are often mistaken for typical reactions, a contaminating Gram-positive coccus was discovered. The control tube containing only antigen was never found to be contaminated with the organism, which was apparently growing in tubes containing serum and antigen, even though the antigen was preserved with 0.3 to 0.5 per cent phenol. It was never found in tubes containing above 1 to 80 dilutions of blood serum.

The authors were led to believe that this is one of the causes of the discrepancies reported by various cooperating laboratories, and give a description of its characteristics. No attempt has been made in this preliminary report to name the organism described.

Further studies on dissemination of Salmonella pullorum infection in incubators, W. R. Hinshaw, H. M. Scott, and L. F. Payne (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 5, pp. 599–610, figs. 2*).—In work at the Kansas Experiment Station bacillary white diarrhea was transmitted to normal chicks from infected eggs hatched from reactor hens in a force-draft incubator in six out of eight hatches. The mortality from *S. pullorum* infection was greatest in the exposed chicks hatched in the same end of the incubator as the infected chicks, and lowest in the exposed chicks hatched in the opposite end. No mortality from bacillary white diarrhea occurred in the control chicks.

Some experiments in disinfecting incubators with formaldehyde, C. J. Coon (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 5. pp. 627–630*).—The author reports upon an incubator of the forced-draft type, 10 ft. wide, 13 ft. long, and 8 ft. high, outside dimensions, and containing eggs, which was satisfactorily disinfected with formaldehyde five times during hatching without apparent harm to the hatch. "Five hundred cc. of formulin sprayed into the machine in normal working condition gave satisfactory results when the machine was not disturbed for 1.5 hours after formalin was introduced. Disinfection was checked by exposing pieces of infected shell in the incubator. It was not found necessary to seal the doors or intake and exhaust openings to prevent the escape of gas."

Completed experiments to determine whether avian tuberculosis can be transmitted through the eggs of tuberculous fowls, C. P. Fitch and R. E. Lubbehusen (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 5, pp. 636–649*).—This is a detailed report of work conducted at the Minnesota Experiment Station, of which an earlier account has been noted (E. S. R., 53, p. 384). As a result of the present work and of that previously reported, the authors view the danger of transmission of tuberculosis through naturally infected eggs as of little practical consequence. The bacteriological studies do not support the view held by some that eggs from tuberculous birds frequently contain tubercle bacteria, nor is it believed that the danger of spreading avian tuberculosis through shipping day-old chicks has any basis in fact. At the same time it is pointed out that eggs do rarely contain tubercle bacilli, and that if such eggs are incubated the number of bacteria is greatly increased.

Avian tuberculosis, E. L. STUBBS (*Jour. Amer. Vet. Med. Assoc., 72 (1928), No. 5, pp. 631–635*).—This is a general review of the status of knowledge of the disease.

AGRICULTURAL ENGINEERING

Ground water levels on the experimental fields for controlled culture at Wageningen from 1921 to 1927 [trans. title], H. Bos (*Dept. Binnenland. Zaken en Landb. [Netherlands], Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefsta., No. 32 (1927), pp. 290–301, pls. 3*).—Data from observation wells on ground water fluctuations as influenced by drainage, run-off, and precipitation over a period of seven years are reported and discussed.

Note on the effect of repeated stresses on the magnetic properties of steel, M. F. FISCHER (*[U. S.] Bur. Standards Jour. Research, 1 (1928), No. 5, pp. 721–732, figs. 13*).—Studies with 1 per cent carbon steel drill rod and 0.13 per cent carbon cold-rolled machinery steel showed that the magnetic changes produced by repeated stresses above the endurance limit are not of a type which can be associated with the characteristic effect of a crack transverse to the direction of magnetization. The similarity of the observed magnetic changes with those brought about by the removal of externally applied static stresses indicates that the observed changes may be produced by the partial relief or redistribution of initially existing internal stresses. The fact that the magnetic changes brought about by understressing are of a similar character, though less in magnitude, suggests that some of the beneficial effect of understressing may be due to partial stress relief.

Accelerated laboratory corrosion test methods for zinc-coated steel, E. C. GROESBECK and W. A. TUCKER (*[U. S.] Bur. Standards Jour. Research, 1 (1928), No. 2, pp. 255–295, figs. 31*).—A comparative study is reported of the merits of two types of accelerated laboratory methods for evaluating the indicated life of the coating on hot-dip zinc-coated sheet steel.

The two methods studied were the simulated atmospheric corrosion, using a moist gaseous mixture of sulfur dioxide, carbon dioxide, and air, and the spray, using normal solutions of sodium chloride and ammonium chloride separately. A consistent relationship between the "life" and weight of the coating was shown by the results. The time required for the breaking down of the coating was considerably less for the first method than for the second. The coating was corroded, in the first method, in a progressive manner over the entire surface and similar to that reported for galvanized materials corroded in the atmosphere under service conditions, and in the second method, in a local and capricious manner. The presence or absence of about 0.2 per cent copper in the steel base produced no apparent effect on the results. Tests were also made on specimens which had been annealed for the purpose of converting the zinc coating into an iron-zinc alloy.

Slag, coke breeze, and clinker as aggregates, F. M. LEA and F. L. BRADY (*[Gt. Brit.] Dept. Sci. and Indus. Research, Bldg. Research, Spec. Rpt. 10 (1927), pp. V+22, pl. 1*).—Experiments are reported which showed that slag will make a sound and strong concrete provided the slag is neither very acid nor strongly basic. It is often better to use only the coarse slag and reject the fines, using sand instead. This not only yields a stronger product, but also obviates possible danger due to the severity of these fines. Coke-breeze concrete is usually rather weak mechanically and is unsuited for use in outside or wet situations, but it has the very important advantage of yielding a light product which can be used for internal walls. Coke breeze may also be usefully employed together with sand as a fine aggregate.

Clinker yields a denser concrete than breeze and of greater strength. It appears, however, that the possible sources of trouble with this material are rather greater than with coke breeze or slag, owing to its even greater lack of uniformity. Unburnt coal may be a particular source of danger in clinker concrete. Clinker, in association with lime, forms a very serviceable aggregate for mortar and plaster, provided the necessary precautions are taken, and for this purpose its pozzolanic properties may render it superior to sand.

A bibliography is included.

Integral waterproofing compounds for concrete, M. B. Lagaard (*Minn. Univ., Engin. Expt. Sta. Bul. 6 (1927), pp. [6]+25, figs. 12*).—Tests of 12 commercial waterproofing compounds and 2 waterproof cements are reported.

The results show that of the 14 materials tested 13 caused a marked reduction in the strength in some concrete mixes. The effectiveness of the materials as waterproofing agents varied greatly. In some cases the concrete was consistently made more water-tight and in others the effect was only slight. With a number of the compounds the results showed beneficial effects for some mixes and harmful effects for others. This introduces the factor of uncertainty as far as their value for waterproofing is concerned. In one case the compound was harmful throughout. In no case was there noticed a tendency to increase workability, and in many cases the effect was to decrease it materially.

The use of many of these materials added to the burden of the mixing operations, in that special handling of the compounds was required.

The results on the standard mixes without waterproofing agents tend to confirm those of other investigators that a richer mix of Portland cement produces a more water-tight concrete and at the same time increases the strength and the workability of the concrete.

In tests of plain concrete the permeability was found to decrease rapidly with a decrease in the water-cement ratio, thus bearing out other tests, indicating that a drier mix will improve the waterproofing quality of the concrete.

Thermal conductivities of walls, concretes, and plasters, E. Griffiths (*[Gt. Brit.] Dept. Sci. and Indus. Research, Bldg. Research, Tech. Paper 6 (1928), pp. IV+19, figs. 13*).—Studies are reported which showed that the phenomenon of heat transmission through a hollow wall is complicated by the convection currents set up in the interspace. The magnitude of these convection currents is dependent on the position of the wall, whether horizontal or vertical, and the dimensions of the interspace.

It was also found that the heat transmission through a hollow wall can be computed from a knowledge of the conductivity of a solid wall of the material and data on the thermal transfer between two vertical hot and cold surfaces.

It was further established that a damp wall has a decidedly higher thermal conductivity than a dry one.

The data obtained on heat transmission coefficients are tabulated.

Tractive resistance of automobiles and coefficients of friction of pneumatic tires, T. R. Agg (*Iowa Engin. Expt. Sta. Bul. 88 (1928), pp. 60, figs. 50*).—Studies conducted in cooperation with the U. S. D. A. Bureau of Public Roads are reported. The results indicate that there is no great difference in the tractive resistance of any particular vehicle on various road surfaces that are reasonably smooth and hard. Paved surfaces in good repair do not give as wide a range of variation in tractive resistance as do the intermediate and low types, nor does the tractive resistance on pavements reach as high maximum values as those determined for some of the low and intermediate types.

The high tractive resistance of mud is due in part to the necessity of squeezing the mud away from the tire as it rolls through the soft surface layer and in part to a certain springiness of the whole road crust.

The yielding of the foundation under the load, where there is a spongy subgrade under a thin road crust, has been found to add approximately 50 per cent to the tractive resistance at a speed of 20 miles per hour. This condition is perhaps of no great consequence so far as light vehicles are concerned, but is a very important one from the standpoint of the truck and bus operator. On a road in this condition fuel consumption will be markedly greater than on the same road when the foundation is stable and unyielding, as it is when dry.

Rough surfaces of a given type generally have a higher tractive resistance than smooth surfaces of the same type. There is a tendency for the tractive resistance curves on certain varieties of roughness to drop at the higher speeds. In some instances they even cross those for smooth surfaces. In other instances the tractive resistance curves for rough surfaces are at all speeds higher than the corresponding curves for smooth surfaces.

The difference in behavior on different rough surfaces seems to be due to the effect of the resiliency of the tire and spring system. With a certain type of recurring roughness, the wheel bounds in such a manner that the tire is partly off the road surface for appreciable time intervals and the distortion of the tire and the power loss therein are reduced below that of a smooth surface. As the air pressure in the tires is lowered, the tractive resistance increases. Laboratory tests indicate that rolling resistance decreases with an increase in the temperature of the tires.

Equalization of the depth of seeding through the furrow opener of a row seed drill, I͡U. A. Veĭs (J. A Weiss) (*Zap. Beloruss. Gosud. Akad. Selsk. Khoz. Im. Okti͡abr. Revoli͡utsii (Ann. Weissruthen. Staatl. Akad. Landw. Gorky), 4 (1927), pp. 185–209, figs. 22; Ger. abs., pp. 208, 209*).—The results of a number of experiments are reported which demonstrated the futility of efforts to obtain a uniform depth of planting in front and rear rows by increasing the load on the rear furrow opener, by mechanical equalization of the angles of penetration of the furrow openers, or by control of the depth of penetration of the furrow openers through variation of the angles of penetration.

It was found that a greater uniformity in the relative and absolute depths of planting is secured by a sharper difference in the loading of the furrow openers, especially where the front furrow openers are loaded much more heavily than the rear ones. Disk furrow openers were found to be unsatisfactory.

Of the furrow openers which penetrate the soil at a sharp angle those of relatively small mass with reference to the length and breadth of the drill gave the best results.

The system of seed dropping was found to be of somewhat less importance in the accuracy of planting. Hose and spiral steel ribbon seed tubes gave a more compact and satisfactory stream of seed.

The oscillation of furrow openers in a vertical plane was found to be greater, even on smooth seed beds, than the vertical pressing action of press wheels or plates.

Research in refrigeration (*Cold Storage, 31 (1928), No. 369, pp. 392, 393, 406, figs. 2*).—An account is given of some of the methods and apparatus, described by E. Griffiths before a meeting of the British Association of Refrigeration, which have been successfully used in refrigeration research. Among these are a spear thermometer for temperature measurements in meat carcasses, a carbon dioxide measuring method based on sound velocity records, a special hygrometer, a dew deposition recorder, and methods for determining the heat generated by stored fruit and the internal pressure in meat during freezing.

RURAL ECONOMICS AND SOCIOLOGY

The progress of research in agricultural economics in the United States, J. D. BLACK (*Sci. Agr., 9 (1928), No. 2, pp. 69–79*).—This paper, presented at the eighth annual convention of the Canadian Society of Technical Agriculturists at Quebec, June 11, 1928, discusses the development and present status of research in agricultural economics in the United States, the value of different lines of research, and the needs in this field.

Survey methods as an approach to the study of agricultural economics, A. BRIDGES (*Oxford: Agr. Econ. Research Inst., Univ. Oxford, 1928, pp. 6*).—This is a paper presented at the meeting of the Agricultural Economics Society, Oxford, England, July 7, 1928.

The present status of agriculture in the United States, J. D. BLACK (*Sci. Agr., 9 (1929), No. 5, pp. 269–281*).—A paper presented at the eighth annual convention of the Canadian Society of Technical Agriculturists, June 12, 1928, discussing prices, production, income, land values, rural wealth, population changes, regional differences, and political aspects.

Harvey Baum: A study of the agricultural revolution, E. S. MEAD and B. OSTROLENK (*Philadelphia: Univ. Penn. Press; London: Humphrey Milford, Oxford Univ. Press, 1928, pp. 149, figs. 6*).—The economic condition of the American farmer, unit costs in agriculture, the reason for low farm prices, scientific farming, and farm relief as a remedy for present conditions are discussed.

Some of the conclusions reached are that "many farmers, exceptional only in intelligence, are able to produce at sufficiently low costs to enable them to make satisfactory profits at present price levels;" that "barring temporary fluctuations, the farmer can not hope to receive a permanent increase in prices;" and that "evidently there is no solution in scientific agriculture for the farmers' ills."

As to farm relief, the authors conclude that it is impossible politically, since "the United States is primarily an urban country" and "its primary interest in the prosperity of the farmer is in the bearing of that prosperity upon the city cost of living." "It is, therefore, difficult to believe that the city population will allow an agricultural minority to increase the city's cost of living by an amount sufficient to preserve the existing number of farmers in their present situation by advancing their net incomes to the point of decent wages and a proper return on their capital;" that farm relief would inflict worse hardships on the farmer than at present; and that "American farming in its present form can not be saved."

Expenditures for industrial training of the younger generation of the farm population are recommended.

An agricultural program for northwest Colorado, T. H. SUMMERS and R. W. SCHAFER (*Fort Collins: Colo. Agr. Col. Ext. Serv., 1928, pp. 60, figs. 21*).—This bulletin presents the agricultural recommendations made by the several committees and approved by the agricultural economic conference held at Steamboat Springs in October, 1927, together with much of the data used by the committees.

The conference was composed of representatives of the Colorado Agricultural College, State University, State School of Mines, the U. S. Departments of Agriculture, Commerce, and Interior, the Denver and Salt Lake Railroad, county commissioners, and livestock organizations, and editors and farmers of northwestern Colorado.

Economic survey of Texas, J. N. Holsen et al. (*St. Louis: Gen. Com. Engin. Dept., Southwest. Bell Tel. Co., 1928, pp.* [3]+*274*+[2], *pls. 2, figs. 62*).—This is a planographed report of a study made in 1927 and 1928 of the present and prospective telephone market of Texas. The data include discussions of the situation and outlook of the agricultural, lumbering, and other industries.

Agriculture in the Prairie Provinces of western Canada, A. Gockel (*Die Landwirtschaft in den Prärieprovinzen West-Kanadas. Berlin: Paul Parey, 1928, pp. 140, figs. 11*).—The natural conditions, history, agricultural and livestock industries, marketing methods and conditions, economic and credit conditions, and the prospect for agricultural development are described.

The output of English farming, H. Rew (*Jour. Roy. Agr. Soc. England, 88* (*1927*), *pp. 16–32*).—This is a discussion of the salient features of the report previously noted (E. S. R., 57, p. 485).

Cyclical fluctuations in agriculture and industry in Russia, 1869–1926, S. A. Pervushin (*Quart. Jour. Econ., 42* (*1928*), *No. 4, pp. 564–592*).—The results are given of a statistical study of the period 1869–1926. The periodic fluctuations in the pre-war period were determined chiefly by the fluctuations in world conjunctures (the so-called business cycles) and the changes in the money returns of Russian agriculture, but the movements in Russian economic life did not follow a path identical with either. The relative weights of the two influences varied in different periods. Simple coefficients of correlation scarcely revealed the complicated relationship, and only the quadrature method of Edge and sliding coefficients enabled the connection to be traced.

Farm products in industry, G. M. Rommel (*New York: R. D. Henkle Co., 1928, pp. XII*+*19–318, pls. 31*).—This book is based upon a survey made during 1927–28 for the Secretary of Agriculture to ascertain the present utilization of farm products in industrial processes and the possible extension and development of such use, to compile the research data, and to indicate the organization and direction of coordinated research work in this field.

Economic aspects of the beef cattle industry, E. C. Voorhies and A. B. Koughan (*California Sta. Bul. 461* (*1928*), *pp. 128, figs. 29*).—This is a study of the chief statistical data regarding the beef cattle industry of the United States and of California in particular.

Tables, maps, and graphs are presented and analyzed showing the trends and cycles in cattle production; production of beef and dairy cattle, calves, and purebred beef cattle; feeding conditions in California; number and trends in slaughter of cattle; consumption of beef; prices and purchasing power of beef cattle; meat prices; cold storage of beef; market movements and shipments of cattle; foreign trade in beef and beef cattle; international trade and situation; and prices of and foreign trade in cattle hides.

Economic history of the production of beef cattle in Iowa, J. A. Hopkins, jr. (*Iowa City: State Hist. Soc. Iowa, 1928, pp. XII*+[2]+*248, figs. 13*).—This is a history of the development of the industry, including an analysis of the place of beef cattle in the farm business, methods of finishing cattle, financing the industry, effects of transportation, and marketing.

[Studies of the tobacco industry of Connecticut] (*Connecticut Storrs Sta. Bul. 150* (*1928*), *pp. 12–14*).—Further data were obtained from the tobacco farms previously studied (E. S. R., 59, p. 482).

Of the farmers growing 1,300 lbs. of tobacco per acre, 50 per cent had a net income of less than $52 per farm; with 1,700 lbs., 50 per cent received over $1,400; and with 1,900 lbs., over $1,850. Yields of over 2,000 lbs. showed no higher net returns than 1,900-lb. yields. One-half of the farmers receiving from 15 to 20 cts. per pound for their tobacco had net incomes of less than $150 per farm, while one-half of those receiving from 30 to 35 cts. had incomes over $1,900. There was no evidence that quality had been increased to a point where the additional cost exceeded the increased return. A yield of 1,500 lbs. per acre and a price over 25 cts. per pound seem necessary for a profit.

Lemons, H. R. Wellman and E. W. Braun (*California Sta. Bul. 460 (1928), pp. 37, figs. 16*).—Tables and graphs are presented and discussed, showing the amount, location, and trends of lemon acreage in California; the trends of shipments and production; consumption of lemons; imports and exports of the United States; production of foreign countries; fluctuations in prices; and the effects of supply, temperature, amount of sickness, and seasons on prices of lemons.

The data indicate that lemon production in California is about at the peak that without heavier new plantings in coming years the normal decrease in bearing acreage will gradually correct the present over-production situation, and that material expansion of the industry in the State should be discouraged.

The Institute for Research in Land Economics and Public Utilities (*Chicago: Inst. Research Land Econ. and Pub. Util., 1928, pp. 15*).—A brief statement of the organization, research program, objectives, accomplishments to date, and existing and proposed projects in general land, urban land, and public utility economics and taxation.

First annual report of the Land Administration Board [Queensland], W. L. Payne et al. (*Queensland Land Admin. Bd. Ann. Rpt., 1 (1928), pp. 180, pls. 23*).—This is the first report of the board covering its work from February 1 to July 31, 1928, and that of the Department of Public Lands for the year ended December 31, 1927, and deals with the administration of the laws relating to the occupation, leasing, and alienation of Crown lands and of various acts and regulations relating to land settlement and matters incidental thereto.

Farm ownership and tenancy in China, J. L. Buck (*Shanghai: Natl. Christian Council, [1927?], pp. [2]+31*).—This is a brief description of the amount of, reasons for, and kinds of tenancy and of farm ownership and tenancy in China, with some suggestions for improvements of conditions.

Land tenure systems in China, D. K. Lieu (*Chinese Econ. Jour., 2 (1928), No. 6, pp. 457–474*).—The chief systems are described and discussed.

Philippine farmers' tax guide, J. E. Velmonte (*Philippine Agr., 17 (1928), No. 7, pp. 351–359*).—A description of the methods of levying and collecting the real property and income taxes in the Philippine Islands.

The income vs. property tax as a source of school revenue, J. W. Davis (*Amer. School Bd. Jour., 77 (1928), Nos. 5, pp. 39–41, 136; 6, pp. 43, 44, 116, 118*).—The theories and systems of taxation, the difficulties and inequalities of the property tax, the recommendations of the National Tax Association, and the advantages of the income tax in raising school revenues are discussed. A bibliography is included.

A comparison of two methods of school financing, H. S. Hunt (*Amer. School Bd. Jour., 77 (1928), No. 5, pp. 46, 47, fig. 1*).—The relative advantages of financing new school facilities by the sale of serial bonds and by the collection of sufficient tax money prior to construction are discussed.

State indexes of prices of farm products, A. G. Black and D. D. Kittredge (*Jour. Farm Econ., 10 (1928), No. 3, pp. 312–330, fig. 1*).—The four types of formulas most generally used in constructing farm price indexes (E. S. R., 58, p. 92) and the formulas used by the Bureau of Agricultural Economics, U. S. D. A. (E. S. R., 51, p. 895), and the agricultural experiment stations of Missouri (E. S. R., 55, p. 589), New York,[2] and Iowa (E. S. R., 55, p. 686), and the questions arising in making and the improvements desired in such index numbers are discussed briefly.

The Minnesota formula is described and the results obtained by its use are discussed. This formula is a modification of Fisher's "Ideal" formula, No. 353, and is of the form

$$\sqrt{\frac{\Sigma[P_1Q_{cm(0)}]}{\Sigma[P_{cm(0)}Q_{cm(0)}]}\times\frac{\Sigma[P_1Q_{cm(1)}]}{\Sigma[P_{cm(0)}Q_{cm(1)}]}}$$

"where P_1 = given monthly price, $P_{cm}(_0)$ = average price for corresponding month of base period 1924–25–26, $Q_{cm}(_0)$ = average amount sold for corresponding month of base period 1924–26, and $Q_{cm}(_1)$ = amount sold in given month."

The improvements suggested in the construction of this formula were (1) to have a system of weighting representative of actual conditions rather than some concept of "normal," as in a monthly weighting which is a fixed annual quantity or a monthly quantity "normal" to each calendar month, and (2) to establish a relationship between the indexes of prices and of incomes.

A table is included showing for the period January, 1910, to December, 1927, inclusive, the monthly and average annual indexes of prices and quantities sold of Minnesota farm products, and the gross cash income of Minnesota farmers.

How the weather, the cost of storage eggs, and the reserves in storage influence the winter egg market (*U. S. Egg and Poultry Mag., 34 (1928), No. 9, pp. 17–21, 64, figs. 4*).—Charts are given, with explanatory notes, showing for the months November to February, inclusive, of the years 1908–09 to 1927–28, inclusive, the deviations in temperature from the normal temperature at Chicago and of United States cold storage holdings of eggs from the average, and the profit or loss of egg storage operations.

Cooperative marketing (*U. S. Senate, 70. Cong., 1. Sess., Doc. 95 (1928), pp. LVIII+721, figs. 6*).—Included are the reports of the Federal Trade Commission to the U. S. Senate made in response to Senate Resolution 34, Sixty-ninth Congress, Special Session, on the development and importance of the cooperative movement, together with the results of the inquiry as it related to illegal interferences with the formation and operation of cooperatives, and on the results of a study of comparative costs, prices, and marketing practices as between cooperative marketing organizations and other types of marketers and distributors handling farm products, together with the letters of submittal of W. E. Humphrey, chairman of the commission. The reports deal principally with organizations engaged in the handling and marketing of farm products and were prepared under the general direction of M. F. Hudson.

Part 1 (pp. 1–406) covers in detail the growth and importance of associations handling the principal farm products marketed, the extent and importance of interferences with and obstructions to the formation and operation of such organizations, and the general organization structure and methods used in financing cooperative marketing organizations and their legal status. Appendixes include important Federal and State laws and copies of the marketing agreements and contracts of several associations.

Part 2 (pp. 407–721) is a study of the costs, prices, and practices of cooperatives and competitors. Cooperative organizations marketing potatoes, eggs and poultry, cotton, wheat, citrus fruits, livestock, butter, fluid milk, and cheese are included, the associations selected being among the most important handling each commodity.

Montana Farm Review, 1927, J. G. Diamond, R. C. Ross, L. S. Tenny, et al. (*Montana, 2 (1928), No. 6, pp. 64, figs. 42*).—This is the annual report of the joint crop-reporting service of the Bureau of Agricultural Economics, U. S. D. A., and the Montana State Department of Agriculture, Labor, and Industry.

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[2] N. Y. Agr. Col. (Cornell), Farm Econ., No. 9 (1928), p. 75.

Statistics are given showing by counties, 1926–1927, the acreage, yield, production, and value of different crops, and the value of farm sales of livestock and livestock products. Other tables and graphs covering periods of varying lengths show the trends of acreage, yields, and prices of different crops, the livestock, dairy, poultry, and bee industries, taxes, land values, bank deposits, farm-labor wages, farm income, investment returns, and prices and purchasing power of farm products.

Crop estimates in England, H. D. VIGOR (*Jour. Roy. Statis. Soc., n. ser., 91 (1928), No. 1, pp. 1–49*).—The official system of estimating the yearly yields of the principal crops of Great Britain is described, and the workings and results of the system are discussed. The paper is followed by several discussions of it (pp. 34–49).

Wholesale prices of commodities in 1927 (*Jour. Roy. Statis. Soc., n. ser., 91 (1928), No. 3, pp. 394–411*).—Included are tables showing the Sauerbeck index numbers, with the *Statist's* continuations after 1912, for 1873, 1896, and 1907 to 1927, inclusive (1867–1877=100), for wholesale prices of 45 commodities by groups; the yearly average index numbers of all commodities, 1846–1927, with Jevons's numbers for 1809, 1810, and 1818 adjusted to the Sauerbeck standard; the monthly index numbers, January, 1925, to May, 1928, by groups of commodities; world's production of silver by countries, 1901–1927; average prices and index numbers of silver, 1909–1927, and for certain other years and periods from 1873 to 1926; world's production of gold by years, 1850–1927; monthly fluctuations of the index numbers (average 45 commodities), January, 1885, to May, 1928; quarterly movements of prices by groups of commodities, 1916–1927; and the average yearly prices and index numbers for each of the 45 commodities.

Agricultural statistics [England and Wales], 1927, R. E. STANLEY (*Jour. Roy. Agr. Soc. England, 88 (1927), pp. 171–190*).—A summary of the statistics of the Ministry of Agriculture and Fisheries on acreages in different crops, livestock and crop production, prices, and imports of agricultural products.

International trade in staple commodities, E. W. PRATT (*New York and London: McGraw-Hill Book Co., 1928, pp. VIII+570*).—This book, which is the outgrowth of a series of lectures at the School of Business, Columbia University, traces the trade from the country of production to the country of consumption in cotton, wool, silk, jute, rubber, wheat, sugar, tea, coffee, Chilean nitrate of soda, coal, petroleum and petroleum products, and lumber.

The production, imports, and exports of the several staples in the leading countries are described. For each staple the organization and operation of the primary marketing systems in the more important producing countries and of the central world markets are discussed and compared.

Grain trade.—I, Export trade, U. CAPRARA (*Il Commercio del Grano.—I, I Mercati Esportatori. Milan: Univ. Com. "Luigi Bocconi," Ist. Ricerche Tec. Com., 1928, pp. XVI+439, figs. 4*).—The organization for and methods used in assembling and exporting grain from North America, Argentina, and other exporting countries are described. Appendixes include copies of contracts, certificates, and other documents used in the trade with Italy.

The grain trade during the World War, F. M. SURFACE (*New York: Macmillan Co., 1928, pp. XXVIII+679, [pls. 7], figs. [12]*).—"This volume presents a history of the more important policies and accomplishments in the Food Administration control of cereals and cereal products during the World War." Its purpose is "to place on record a discussion of the policies and accomplishments of the Food Administration Grain Corporation and its successor, the

United States Grain Corporation, in carrying out the mandates of Congress regarding a guaranteed price for wheat and in producing an adequate supply of cereal foods for ourselves and the Allied nations."

Survey of the wheat situation, April to July, 1928, M. K. BENNETT ET AL. (*Wheat Studies, Food Research Inst.* [*Stanford Univ.*], *4* (*1928*), *No. 10, pp.* [*1*]+*357–390, figs. 7*).—This is a continuation of the survey previously noted (E. S. R., 59, p 885). Included are studies of new crop developments, visible supplies and outward carry-overs, wheat price movements, international trade, and the outlook for the new crop year.

The Scottish Milk Agency, Ltd., a producers' pioneer marketing enterprise, R. B. FORRESTER (*Jour. Min. Agr.* [*Gt. Brit.*], *35* (*1928*), *No. 2, pp. 125–137, fig. 1*).—This is a description of the organization and operation of the Scottish Milk Agency, Ltd., a producers' marketing organization in the Glasgow and Clyde Valley area of Scotland, the objects of which are to carry on business as buyers and sellers of milk and milk products, to secure markets for its members, and to dispose of surpluses above the requirements of the liquid-milk market.

The origin and character of the rural population of Connecticut (*Connecticut Storrs Sta. Bul. 150* (*1928*), *pp. 28, 29*).—An analysis of data obtained by personal interviews with 735 Connecticut farmers showed that vocational mobility is much greater for daughters than for sons of farmers; that the fathers and grandfathers of most men who have farmed for any considerable period and of their wives to a lesser degree were farmers; that the peak of vocational mobility is at the age of from 22 to 24 years, from which time the curve drops rapidly until the age of about 60, after which there is little change; and that residential mobility radiates in a descending sequence from the town of present residence toward the larger geographic divisions.

Vital registration in Europe, P. G. EDGE (*Jour. Roy. Statis. Soc., n. ser., 91* (*1928*), *No. 3, pp. 346–393*).—The development of official statistics and the differences in practices in the different countries of Europe and the United States are described. Included are a bibliography and appendixes showing for the several countries of Europe the requirements as to the registration of births and deaths, nomenclatures employed, examples of the rules followed in tabulation, and requirements as to the transmission of data. Several discussions follow the paper (pp. 379–393).

The church and the agricultural crisis, E. DES. BRUNNER (*Boston: Pilgrim Press, 1928, pp. 44*).—Included are digests of the 1927 Alden Tuthill lectures of the Chicago Theological Seminary on the church and the agricultural crisis, the church and the revolution in rural social life, and town and country church administration.

Urban-rural relations, edited by C. C. TAYLOR and N. T. FRAME (*Chicago: Kiwanis International, 1928, pp.* [*2*]+*246*).—This is a compilation of excerpts on urban-rural relations prepared as a preconvention manual for the conference of the American Country Life Association held at Urbana, Ill., June 19–21, 1928, and as a handbook for leaders in Kiwanis clubs and other organizations interested in the betterment of urban-rural relations.

Producers and consumers: A study in co-operative relations, M. DIGBY (*London: George Routledge & Sons, 1928, pp. X+203, fig. 1*).—This study, made for the Horace Plunkett Foundation, describes and discusses the British and international policy regarding cooperative organizations of producers and consumers, the relations of the Cooperative Wholesale Society in England and Scotland and similar organizations in other countries with farmers' societies, and the interrelations between such organizations in different countries.

Handbook of rural social resources, 1928, edited by B. Y. LANDIS (*Chicago: Univ. Chicago Press, 1928, pp. XI+226*).—Part 1 contains the following articles: The Rural Population, by C. E. Lively (pp. 1–13); Farmers' Standards of Living, by E. L. Kirkpatrick (pp. 14–26); The Development of Rural Art, by A. M. Clark (pp. 27–37); Rural Education, by E. Burnham (pp. 38–49); Rural Social Work, by L. A. Ramsdell (pp. 50–61); The Rural Work of the Catholic Church, by E. V. O'Hara (pp. 62–67); The Situation among Protestant Rural Churches, by R. S. Adams (pp. 68–76); Organized Rural Recreation, by L. F. Hanmer (pp. 77–87); Farm Women's Organizations, by G. E. Frysinger (pp. 88–99); National Agricultural Legislation, 1921–25, by R. S. Fletcher and H. F. Fitts (pp. 100–114); The Coöperative Marketing Movement, by B. Y. Landis (pp. 115–127); Farm Credit and Farm Taxation, by N. J. Wall (pp. 128–134); Agricultural Production, Prices, and Income, by L. H. Bean (pp. 135–153); and Some Agricultural Policies of European Nations, by A. Hobson (pp. 154–162).

Part 2 consists of statements of the programs and present services of 31 national agencies that are members of the National Council of Agencies Engaged in Rural Social Work.

Elements of rural sociology, N. L. SIMS (*New York: T. Y. Crowell Co., 1928, pp. XIV+698, pl. 1, figs. 84*).—This text approaches the subject of country life from the angle of the urbanite. "Society is thought of in terms of energy manifest organically, materially, and culturally in the unity which we call the human group." Sociology is defined as "the study of the behavior of the energy of such groups;" and the field of rural sociology, according to the author, is "the study of association among people living by or immediately dependent upon agriculture."

The material is presented under the headings of the vital element, the cultural element, the material element, and the structural element.

FOODS—HUMAN NUTRITION

Hunger fighters, P. DE KRUIF (*New York: Harcourt, Brace, and Co., 1928, pp. [7]+377, figs. 26*).—This presents in a popular way some of the contributions of science to human sustenance in the following chapters: Book 1, wheat: The wheat dreamer—Carleton, and the wheat finders—Mackay and others more eminent; book 2, meat: The scientific Bolshevik—Dorset, a man for fundamentals—Mohler, and the automatic man—Francis; book 3, maize: The maize finders—ancient and anonymous, the maize breeder—Shull, and new soil from old—Hoffer; and book 4, the hidden hunger: Finder of the hidden hunger—Babcock, the sun trapper—Steenbock, and the soft-spoken desperado—Goldberger.

The baking strength of Arizona Early Baart flour, M. C. SMITH (*Arizona Sta. Tech. Bul. 23 (1928), pp. 549–607*).—This is the complete report of the investigation which has been noted from other sources (E. S. R., 59, p. 890).

Growth of rats on vegetarian diets, H. and D. Y. WU (*Chinese Jour. Physiol., 2 (1928), No. 2, pp. 173–194, figs. 6*).—Various combinations of cereals, legumes, and vegetables common in north China have been compared with the Sherman diet B (⅔ ground whole wheat and ⅓ dried whole milk) with respect to growth and reproduction of rats. Most of the combinations tested were definitely rachitic and failed to support normal growth. An exception to this was a diet containing "small cabbage," a variety of *Campestris chinensis*. This vegetable proved to be quite rich in vitamin D as determined by the cure of rickets and increased rate of growth. Several vegetables similar to the small cabbage and all belonging to the genus Brassica gave similar but not quite as good results.

In discussing the general failure of the vegetarian diet, the authors state that "we have experimented with all the common cereals, probably the best legumes, and some 20 varieties of vegetables, and we have found no combination of them comparable with our standard diet. Different types of food may supplement each other's deficiency when used in combination, but no mixture of foods with similar dietary deficiency can yield an adequate diet. Although we have experimented with mixtures containing in most instances one cereal, one legume, and one vegetable, it is improbable that much improvement can be made with more complex combinations, since the simple mixtures seem to have the same fault.

"We may thus conclude that we know of no vegetarian diet at present which would afford optimum nutrition for an omnivorous animal, the albino rat. Since the metabolism of the rat has been shown to be very similar to that of the human being, who for many thousands of years has been also omnivorous, it seems justifiable to conclude that optimum nutrition of human being can not be obtained with purely vegetarian diets."

Self selection of diet by newly weaned infants: An experimental study, C. M. Davis (*Amer. Jour. Diseases Children, 36 (1928), No. 4, pp. 651–679, figs. 13*).—This paper reports the food selection and consumption for periods of 6 months of two babies and 12 months of another who, during the experimental periods, were allowed to choose their own foods in such quantities as they desired from a fairly wide range of commonly used natural food materials unmixed, unseasoned, and unaltered except in the case of some by cooking in the simplest manner. The experiment was begun at weaning and the growth and general nutritive condition of the children were followed carefully.

With the exception of a short period of acute infection in one of the subjects there were no digestive disturbances, in spite of the fact that definite preferences, changing from time to time, were shown for special foods which were eaten almost exclusively for a time and then scarcely touched. All three subjects were omnivorous, with a liking for most of the foods offered, but rarely ate more than three solid foods in considerable quantity at any one meal. The appetite was uniformly good, the stools were satisfactory, the blood counts, tooth and bone development, musculature, and general vigor and growth normal. One of the babies had rickets at the beginning of the experiment and took cod-liver oil voluntarily until the rickets had healed. The other two showed no evidence of rickets throughout the experimental period.

The self selection of diet in infancy (*Jour. Amer. Med. Assoc., 91 (1928), No. 20, p. 1552*).—In this editorial discussion of the investigation noted above, attention is called to the recommendations of Rose (E. S. R., 52, p. 258) concerning infant feeding—that it must be a matter of principle and not of impulse, with the reward in the future quite as much as the present; in other words, that although the results of perversion of appetite are not immediately apparent, it is essential to form good habits early in life in order to stand the inevitable strain of later life. It is suggested that the chief value of the Davis experiments is in pointing out that a moderate deviation from the fixed conventions of infant and child feeding may be attempted without fear of disastrous results.

Calcium and phosphorus balances in rats during period of pregnancy and lactation, H. Goss and C. L. A. Schmidt (*Soc. Expt. Biol. and Med. Proc., 26 (1928), No. 2, p. 104*).—In this preliminary report it is noted that female rats on a constant diet stored calcium and phosphorus during pregnancy in amounts in excess of that estimated to be contained in the litter at birth, but that during the period of lactation, in spite of a marked increase in the intake of calcium and phosphorus, the balances were negative.

The commercial application of Lactobacillus acidophilus milk, E. L. REICHART and H. P. DAVIS (*Nebraska Sta. Bul. 228 (1928), pp. 19*).—This publication contains a brief review of the literature on the therapeutic value of *L. acidophilus* in milk culture; the report of studies on the isolation of the organism from the feces of rats on high lactose diets, the change in the intestinal flora of rats following feeding with *L. acidophilus* cultures, and the growth and viability of the organism under varying conditions; and a description of the commercial method of manufacturing acidophilus milk and general directions for its use. An extensive list of literature references is appended.

A comparison of raw, pasteurized, evaporated, and dried milks as sources of calcium and phosphorus for the human subject, M. M. KRAMER, E. LATZKE, and M. M. SHAW (*Jour. Biol. Chem., 79 (1928), No. 1, pp. 283–295*).—The general plan and preliminary results of this investigation have been noted previously (E. S. R., 56, p. 896).

In children and adults the retention of calcium was uniformly higher on fresh milk than on dried milk, other factors remaining unchanged. In adults pasteurized milk and milk from cows kept in the barn gave less favorable balances than the fresh herd milk, but evaporated milk gave results at least as good as fresh milk. In general, the phosphorus balances followed the trend of the calcium balances.

The influence of diet on the structure of teeth, M. MELLANBY (*Physiol. Rev., 8 (1928), No. 4, pp. 545–577, figs. 9*).—This is largely a review of the investigations on the subject which have been conducted during several years by the author (E. S. R., 52, p. 763) and by E. Mellanby (E. S. R., 52, p. 367; 55, p. 895). A list of 85 references to the literature is appended.

The fuel for human power (*Jour. Amer. Med. Assoc., 91 (1928), No. 19, pp. 1464, 1465*).—An editorial discussion of the conflicting literature on the source of energy for muscular contraction, including papers by Henderson and Haggard (E. S. R., 53, p. 863), Furusawa (E. S. R, 54, p. 292), Rapport and Ralli (E. S. R., 59, p. 391), and Marsh (E. S. R., 60, p. 193).

The energy metabolism of women while ascending or descending stairs, F. G. BENEDICT and H. S. PARMENTER (*Amer. Jour. Physiol., 84 (1928), No. 3, pp. 675–698, fig. 1*).—In this investigation of the energy consumption of staircase climbing, a modified respiration apparatus was employed, the novel feature of which was that the greater part of the weight was carried by the operator instead of the subject. The apparatus is described and illustrated. Measurements were made during horizontal walking, during the ascent of an ordinary flight of stairs, and during the ascent and descent of a mountain stairway of 522 steps. Twelve young women students at Mount Holyoke College served as subjects.

During the horizontal walking at speeds of 34, 65, and 89 meters per minute (1.86, 3.55, and 4.86 miles per hour), the total heat production per horizontal kilogrammeter averaged 1.18, 0.79, and 0.87 gm. calories, the increment in heat production over the energy required for standing averaging 0.64, 0.52, and 0.67 calories per horizontal kilogrammeter. "These values indicate that the optimum rate of walking is at about 65 meters per minute and that sauntering is uneconomical."

Ascending an ordinary flight of stairs from a standing start at rates of 72 and 92 steps per minute resulted in a total energy expenditure averaging 8.8 and 8.4 gm. calories, respectively, per vertical kilogrammeter. After a walking start the average value was 10.7 calories. In ascending the mountain stairway the total energy per vertical kilogrammeter averaged 12 gm. calories, and in descending 3.9 calories per vertical kilogrammeter.

"For practical purposes it can be considered that the average person expends the same amount of energy in walking up one average flight of steps (15 steps each 20 cm. high) as he does in walking on a level 15 times the distance represented by the vertical height of such a staircase, or as he does in descending three such flights of steps These comparisons may be helpful to the physician in prescribing exercise for patients."

The effects of inanition and vitamin B deficiency on the testis of the pigeon, G. F. Marrian and A. S Parkes (*Jour. Roy. Micros. Soc., 48 (1928), No. 3, pp. 257–270, pls. 5, fig. 1*).—This investigation deals chiefly with the condition of the testicles in pigeons suffering from lack of vitamin F and vitamin G, respectively. The diets and technique followed were the same as described by Marrian et al. (E S. R., 58, p 893). In addition to normal, inanition, and vitamin B-deficient controls, some of the pigeons received the basal diet plus 1 gm. daily of autoclaved yeast as a source of vitamin G (B_2), and others the Kinnersley-Peters vitamin F concentrate (B_1).

In general behavior no striking differences could be observed between the pigeons on the B-deficient and F-deficient rations. Those on the G-deficient rations showed early symptoms of vomiting, but this condition did not become noticeably worse after the tenth day.

The gross and histological appearance of the testicles in the various groups is described in considerable detail. The most important observations noted were the similarity between the changes in F and total B deficiency and the comparatively slight degenerative changes in the G-deficient birds. Although admitting that degenerative changes may be initiated in the testes of pigeons by a wide range of unfavorable conditions, the authors are of the opinion that the testicular degeneration resulting from a deficiency in vitamin B or F is not necessarily the result of inanition. Vitamin G, however, is considered to be relatively unnecessary as compared with vitamin F for the maintenance of nutrition of the testis.

The effect of inanition and vitamin B deficiency on the adrenal glands of the pigeon, G. F. Marrian (*Biochem. Jour., 22 (1928), No. 3, pp. 836–844*).—This study is concerned chiefly with the condition of the adrenal glands of the series of pigeons used in the study of the effects of inanition and deficiency of vitamins B, F, and G, respectively, on the testis, noted above.

The previous observations of Marrian et al. (E. S. R., 58, p. 893) on the hypertrophy of the adrenals in starving pigeons receiving vitamin B and in pigeons forcibly fed on an artificial vitamin B-free diet were confirmed, and in addition evidence was obtained indicating that while a deficiency of both vitamin F and G is involved in the hypertrophy occurring in the vitamin B-deficient pigeons, the deficiency of F is of greater importance than of G. It is suggested that in starvation the changes occur mainly in the medulla and in vitamin B deficiency in the cortex.

Rheumatic symptomatology and vitamin B, M. Emslie (*Jour. Roy. Sanit. Inst., 49 (1928), No. 4, pp. 221–228*).—Attention is called to the similarity in the symptoms of rheumatism in children and vitamin B deficiency in experimental animals as noted in the literature, and to the inadequacy with respect to vitamin B of the typical diets of English infant welfare centers and hospitals.

Note on tea as a source of vitamin C, H. A. Mattill and A. D. Pratt (*Soc. Expt. Biol. and Med. Proc., 26 (1928), No. 2, pp. 82–85*).—Infusions of various teas were tested for antiscorbutic properties on a series of 300-gm. guinea pigs rendered scorbutic by the Sherman basal ration (equal weights of rolled oats and wheat bran). The minimum daily curvative doses of 2 per cent infusions from different teas were Japan Green Pan Fired between 10 and 15 cc., Japan

Green Basket Fired not less than 20 cc., Oolong not less than 25 cc., and Orange Pekoe considerably more than 25 cc.

It is suggested that these differences are probably due to the methods of preparation rather than differences in the original tea plants, green tea being unfermented and black tea fermented previous to drying. In commenting upon the practical application of these findings, the authors emphasize that in spite of its fairly high content of vitamin C green tea should not be used as an antiscorbutic to replace natural foodstuffs, but suggest that it may be of value in the rations prepared for expeditions, military or otherwise, into difficultly accessible regions.

A comparative study of vitamin C in bergamot juice and lemon juice [trans. title], R. DEMARCO (*Bol. Soc. Ital. Biol. Sper., 2* (*1927*), *No. 9, pp. 1023–1026*).—Preliminary studies on the vitamin C content of bergamot juice indicate its presence, but in smaller quantities than in lemon juice.

The antiscorbutic fraction of lemon juice, VII, S. S. ZILVA (*Biochem. Jour., 22* (*1928*), *No. 3, pp. 779–785*).—In this continuation of the investigation previously noted (E. S. R., 58, p. 391), further evidence is presented in favor of the hypothesis that in the chemical fractionation of vitamin C a reducing substance is removed which is capable of exerting a protective action on the vitamin in its natural medium, possibly through serving in a buffer capacity against a thermolabile factor. The evidence is as follows:

The antiscorbutic activity of decitrated lemon juice disappeared within 24 hours after the reducing substance had been neutralized with phenolindophenol and the solution adjusted immediately to pH 7.

Comparatively pure fractions prepared by the method described in a previous paper (E. S. R., 57, p. 488), lost their antiscorbutic property much more rapidly than did decitrated lemon juice of similar activity, thus suggesting that a protective substance had been removed during fractionation.

Decitrated lemon juice dialyzed through a collodion thimble previously soaked in 83 per cent alcohol retained most of its antiscorbutic property and slightly less than half its reducing property, while similar juice dialyzed through a 92 per cent thimble retained none of its antiscorbutic or reducing properties. The possibility is suggested that the vitamin C molecule may be even larger than hitherto surmised, and that its apparent inactivation on dialysis is due to diffusion of the reducing agent.

Deterioration on storage of the antiscorbutic property of decitrated lemon juice autoclaved anaerobically was definitely retarded by acidity, but the presence of acid during the autoclaving did not prevent the change subsequently taking place on storage of the juice in neutral reaction.

Decitrated lemon juice autoclaved at 40 lbs. pressure (143° C.) for one hour under strictly anaerobic conditions showed very little loss in antiscorbutic properties.

The antiscorbutic vitamin value of some Peking fruits, K. L. HSÜ (*Chinese Jour. Physiol., 2* (*1928*), *No. 1, pp. 41–44, pls. 2*).—In this report on the vitamin C content of various Chinese fruits used in the winter in Peking, growth curves are given of four guinea pigs each on a basal scorbutic diet supplemented by 5 gm. of "red fruit" (*Crataegus pinnatifida*), 15 gm. of "haitang" (*Pirus spectabilis*), 25 gm. of persimmons, and 6 gm. of sugar-coated red fruit, respectively. These curves and data reported for other amounts of these fruits are thought to indicate that red fruit is about one-third as potent as orange juice as a source of vitamin C, and that the other two fruits are deficient in vitamin C. The data on persimmons confirm an earlier report of Embrey (E. S. R., 49, p. 563) to the effect that the minimum protective dose of Chinese persimmons lies between 25 and 30 gm. daily. The practice of dipping red fruit in a sugar sirup at a temperature of 110 to 120° C. for a few minutes and allowing the sirup to dry on its surface did not appear to decrease its content of vitamin C.

Vitamin D in adults: Its effect on the calcium and inorganic phosphate of the blood, R. E. Havard and J. C. Hoyle (*Biochem. Jour.*, *22* (*1928*), *No. 3*, *pp. 713–716*).—In order to test the hypothesis advanced in an earlier paper (E. S. R., 55, p. 894) that the higher phosphate values in the blood of normal adults in summer than in winter are due to increased incidence of ultra-violet light, two series of experiments were run during winter. In one of these the effect was determined of daily administration of irradiated ergosterol and in the other of exposure to ultra-violet light upon the total inorganic phosphate of whole blood and serum calcium. In the first series of experiments, two subjects received 4 mg. of irradiated ergosterol for 11 and 13 days, respectively, a third received 8 mg. daily for 21 days, and a fourth served as control. In the second, two subjects were irradiated 5 days a week for a total period of 16 days by means of three carbon-arc white-flame lamps, each about 4 ft. distant, the time of exposure being gradually raised to 30 minutes daily.

In no case was there any significant change in the level of blood phosphate or serum calcium.

A summary of recent work on Vigantol (irradiated ergosterol), W. Pfannenstiel (*Lancet* [*London*], *1928*, *II*, *No. 16*, *pp. 845–847*).—A review of recent literature on the discovery that ergosterol is the precursor of vitamin D and on the treatment of animal and human rickets with irradiated ergosterol. An extensive list of literature references is appended.

Rôle of vitamins in the etiology and cure of gastric and duodenal ulcers, S. Harris (*Jour. Amer. Med. Assoc.*, *91* (*1928*), *No. 19*, *pp. 1452–1457*).—This is a practical discussion, with sample diets, of the treatment of ulcers in the gastrointestinal tract by diets rich in vitamins A, B, and C, and well balanced in respect to other dietary constituents. In the author's experience "the high carbohydrate-poor vitamin diet that the large proportion of American people live on may predispose to ulcer, though the exciting cause of the ulcer is a superimposed infection. In other words, an unbalanced low vitamin diet lowers the resistance of the patient. In the diet during the treatment of ulcer the vitamin content should be considered, and the patient should be kept on a rational diet for some time afterward to prevent a recurrence of the disease."

Experimental calculi [trans title], E. C. van Leersum (In *Handelingen van het 21. Nederlandsch Natuur- en Geneeskundig Congres, Amsterdam, 1927. Haarlem: Kleynenberg & Co., 1927, pp. 228–231*).—Essentially noted from another source (E. S. R., 58, p. 792).

Etiology of dermatitis of experimental pellagra in rats, W. D. Salmon, I. M. Hays, and N. B. Guerrant (*Jour. Infect. Diseases*, *43* (*1928*), *No. 5*, *pp. 426–441*, *figs. 8*).—This paper, which should be consulted in the original for the detailed descriptions and photographic illustrations, describes the external symptoms of experimental pellagra in rats and the internal lesions of advanced cases, and discusses the relation of dietary deficiency and concomitant infection as etiologic factors in the production of the disease.

On the basal pellagra-producing ration previously described (E. S. R., 58, p. 894), young rats make little or no increase in weight, but show no particular symptoms for about 2 to 4 weeks after the preliminary depletion period of 2 weeks. The symptoms which then develop gradually are alopecia, dermatitis, stomatitis, ophthalmia, and arthritis, and usually cachexia. The internal lesions of advanced cases are "hemorrhagic gastroenteritis, atrophy of the spleen, fatty infiltration or degeneration of the liver, cloudy swelling of the kidneys, and often cystitis. There is a relation between the character of the diet and the occurrence of the syndrome. A mild dermatitis has been found among mature rats receiving a diet which is adequate for excellent growth and reproduction. The severe form has been produced only on restricted diets."

Bacteriological examination of the lesions has revealed the invariable presence of a Gram-positive coccus about 1 micron in diameter. This organism under ordinary conditions is not pathogenic. It is incapable of producing typical pellagrous lesions by injection, but when fed in massive doses produces the characteristic syndrome readily in about 80 to 85 per cent of the test animals and eventually in all of them.

Concentrates of the preventive factor prepared from kudzu leaves by a procedure slightly modified from the one previously described for velvet bean leaves have not only proved effective in prophylactic and curative tests but have been demonstrated to inhibit the growth of the causative organism in culture medium.

The amount of the protective factor required for complete protection is thought to depend to some extent on the number and virulence of the organisms ingested and the age and individual susceptibility of the animal. Young animals are much less susceptible than older ones.

The possibility is suggested that the pellagra-preventive factor may not be identical with vitamin G, since the correlation between the degree of protection against infection and the rate of growth is not always good.

Food allergy: Its manifestations, diagnosis, and treatment, A. H Rowe (*Jour. Amer. Med. Assoc., 91 (1928), No. 21, pp. 1623–1631*).—A summary of the author's experience in the diagnosis and treatment of food allergy, with a description of the various manifestations of such allergy, the detection of specific foods responsible, and the dietary treatment of the condition.

TEXTILES AND CLOTHING

Annual wool review for 1927, J. B. McPherson (*Bul. Natl. Assoc. Wool Manfrs., 58 (1928), Extra No. 1, pp. 107–233, pls. 2*).—This review resembles that of 1926 (E. S. R., 56, p. 898) in its scope, embracing information and statistics on the domestic wool clip, imports of wool, manufactures, and other activities of the industry.

A method of preparing thin cross and longitudinal sections of cotton fibers and its importance in cell-wall research, J. Kisser and D B. Anderson (*Amer. Jour. Bot., 15 (1928), No. 7, pp. 437–441, fig. 1*).—The new method devised for preparing sections of cotton fibers is said to be promising for cell wall investigation and other aspects of cotton research.

A study of the shrinkage of cotton woven materials, G. H. Johnson (*Amer. Dyestuff Rptr., 17 (1928), No. 19, pp. 725–731*).—Laundering experiments on several kinds of cotton woven materials indicated that shrinkage occurs very rapidly, varies in quantity with the fabric. and is largely controlled by moisture. Temperature, washroom supplies, length of washing formula, and variation in pounding action were of slight effect. The warp shrinkage generally, but not always, exceeded the filling shrinkage. About 85 per cent of the warp shrinkage took place during the first washing, regardless of the washing methods used. From 65 to 85 per cent of the shrinkage obtained was due to the moisture or soaking alone.

Methods of boiling off silk, W. W. Bray, J. B. Crowe, and S Meeker (*Amer. Dyestuff Rptr., 17 (1928), No. 20, pp. 743–748*).—The more common methods of degumming silk are compared, with comments on their merits.

The effect of sunlight and perspiration upon weighted silk fabrics, M. Furry and R Edgar (*Amer. Dyestuff Rptr., 17* (*1928*), *No. 21, pp. 781, 782*).—Five silk taffetas were studied at the Iowa State College in an attempt to determine quantitatively the deterioration due to the action of sunlight and perspiration. Breaking strength (strip method) tests with fabrics exposed to sunlight for 40 days showed that the weighted taffetas, with or without previous perspiration treatment, deteriorated more rapidly upon exposure to light than unweighted taffeta. Taffetas subjected to acid perspiration treatment deteriorated more upon light exposure than those subjected to alkaline perspiration treatment. The deterioration of the latter was somewhat less than that of the untreated fabrics.

Progress in the standardization of tests for fastness to light, W. D. Appel (*Amer. Dyestuff Rptr., 17* (*1928*), *No. 20, pp. 755–761, fig. 1*).—The progress made by the subcommittee on light fastness (E. S. R., 59, p. 693) is reviewed, with discussion of daylight exposures, factors affecting results of exposure, accelerated fading tests, and proposed standardization of tests.

Accurate determination of color (*Textile World, 74* (*1928*), *No. 21, pp. 57, 59, figs. 5*).—The recording spectrophotometer, a device developed at the Massachusetts Institute of Technology and described and illustrated, is said to eliminate human judgment entirely and to measure automatically the color and wave lengths of any substance rapidly and with precision.

The influence of heat on the affinity of cotton for dyestuffs, C. K. Patel (*Jour. Soc. Dyers and Colourists, 44* (*1928*), *No. 10, pp. 301, 302*).—Cotton yarn and calico heated at 150° C. for a long time (3 hours) or at higher temperatures for a short time at the College of Technology, Manchester, had a lower affinity for dyes of the direct and basic classes. With the direct colors used, Chlorazol Sky Blue FF and benzopurpurine, the loss in affinity for dyes seemed progressive. The affinity for dyes decreased as the heating was prolonged. The loss on heating with the basic dye methylene blue was marked up to a certain stage and rather small thereafter.

Novel method of increasing the affinity of cotton and other fibres for colouring matters, G. E. Holden (*Jour. Soc. Dyers and Colourists, 44* (*1928*), *No. 10, pp. 305, 306, pl. 1*).—Since cotton fabric impregnated with gelatin solution and afterwards heated, preferably by steaming under pressure for about 1 hour, increased its affinity for certain coloring matters, more elaborate investigations were made with cotton, wool, silk, and rayons in association with a wide range of dyestuffs. In general, treatment with gelatin greatly increased the affinity of material for the dye, the increase being notable in wool, silk, and rayon but still more pronounced in cotton. The treatment of cotton consists simply in immersing or padding the material with a hot solution of gelatin, steaming for 1 hour at 5 lbs. pressure, and subsequently washing. Applications of the process are discussed briefly, and a new method of producing figured effects on pile fabrics is outlined.

Lichen dyeing to-day: The revival of an ancient industry, A. R. Horwood (*Sci. Prog.* [*London*], *23* (*1928*), *No. 90, pp. 279–283*).—An account of characteristics of dyes made from lichens and their use in dyeing tweeds and homespuns.

The dyeing of gloving and clothing leathers, M. C. Lamb (*Jour. Soc. Dyers and Colourists, 44* (*1928*), *No. 8, pp. 225–229*).—Practical directions are outlined.

Some causes of uneven dyeing, H. R. Hirst (*Jour. Soc. Dyers and Colourists, 44* (*1928*), *No. 6, pp. 163–169, figs. 8*).—Experiments involving the dyeing of wool fabrics showed that uneven dyeing could be variously traced to the rate of absorption of the dye, uneven temperature, modification of the fiber by alkali or acid, unevenness in steaming operation, and the action of sunlight and air.

Other causes of uneven dyeing include mildew and soil bacteria, faulty mechanical manipulation during spinning and weaving, uneven conditioning, and storage conditions.

Report on stains produced by May flies, C. C HUBBARD (*Natl. Rev., 5 (1928), No. 12, p. 12*).—The eyes of the May fly, or lake fly, produce a distinctly violet or deep plum colored stain on fabrics, and the removal of the stain has been of considerable concern to dry cleaners. Cotton fabric liberally stained with the crushed eyes of the insects was subjected to an overnight treatment in lukewarm water containing 2 per cent of desizing (malt diastase) agents so as to convert the albumin to sugar, and the fabric was then rinsed thoroughly. Of nine reagents tested after this treatment, only sulfonated castor oil removed the stains practically completely.

Removing crayon from yarn and roving, A. H. GRIMSHAW (*Cotton, 93 (1928), No. 2, pp. 132, 133, fig. 1*).—Tests at the North Carolina State Textile School wherein oiled and unoiled cotton yarns marked with chalk of many different colors from several manufacturers were scoured by three methods showed that many colors could be used with safety. Black, brown, gray, and others, such as tan, probably containing black, were harder to remove than other colors. Spraying with emulsifiable oil did not interfere with scouring nor give additional difficulty.

The valuation of protective agents, H. BLACKSHAW (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 10, pp. 297–299, figs. 2*).—Tests are outlined for the valuation of products protecting wool and silk against the action of alkali.

Improvements in dry-cleaning and laundry processes, A. E. HATFIELD and E. A. ALLIOTT (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 6, pp. 170–177, figs. 9*).—Recent improvements in dry-cleaning methods are reviewed.

MISCELLANEOUS

Report of the director [of Connecticut Storrs Station], 1928, W. L. SLATE (*Connecticut Storrs Sta. Bul. 150 (1928), pp. 35, figs. 12*).—This contains the organization list, a report of the director, and a financial statement for the fiscal year ended June 30, 1928. The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES

Purdue University and Station.—The resignations to engage in commercial work are noted of Dr. G. N. Hoffer as associate botanist and pathologist and Walter V. Kell as assistant county agent leader. Recent appointments include O. B. Riggs as assistant in agronomy in charge of corn borer work, effective January 1; Dr. John F. Bullard, assistant veterinarian of the Kentucky Station, as assistant animal pathologist, effective February 1; and Leon C. Todd, assistant in poultry husbandry extension at the Michigan College, as assistant in poultry husbandry in the department of agricultural extension, effective January 1.

Kansas College.—*Kansas Industrialist* announces that a $500 fellowship for research in wheat milling has been recently offered the college by the Association of Operative Millers.

Massachusetts College and Station.—W. H. Tague has been appointed assistant professor in agricultural engineering and will take up investigational work in fruit storage and equipment for fertilizer distribution. Dr. Carl R. Fellers, research professor in horticultural manufactures, has been granted leave of absence and will make a study of prevailing practices in the commercial canning industry.

Michigan Station.—A fund has been provided by W. K. Kellogg of Battle Creek to finance research in nut culture in the department of horticulture for a period of four years. James A. Neilson of the Vineland Experiment Station, Ontario, has been appointed research assistant for this work, effective April 1.

Dr. C. S. Robinson, research associate chemist, was appointed on January 1 as head of the chemistry section of the station to take the place of Dr. A. J. Patten, whose resignation has been previously noted. Other appointments, effective February 1, include R. L. Cook and K. T. Wright as research assistants in soils and farm management, respectively.

Missouri University.—A special curriculum for the training of public welfare workers and leading to the new degree of bachelor of science in rural public welfare has been begun with the current semester. This work will be open only to students who have completed a full high school course and two years in the university, and is expected to qualify its graduates after two years for positions as boy scout executives, boys' and girls' club agents, and related positions.

Oregon College.—A two-year course in agriculture is to be offered beginning next fall. This course will not lead to a degree, but credits earned in it may be transferred to the regular four-year course if desired. The regular college entrance requirements must be met before admission, and the grade of work to be offered will be of the same standard as that in the degree courses.

Dr. Gustav Wilster has been appointed professor of dairy manufactures, vice V. D. Chappell, resigned.

Virginia Truck Station.—A two-story fireproof office and laboratory building has been completed at a cost of $30,000 under an appropriation made at the last session of the general assembly.

Washington College.—*School and Society* states that permission has been granted to establish a chapter of Phi Beta Kappa in the college. The new chapter is said to be one of the first to be authorized in a land-grant college.

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V

EXPERIMENT STATION RECORD

Vol. 60 May, 1929 No. 7

For many years it has been the custom of *Experiment Station Record* to present an annual summary and discussion of the acts making appropriations for the support of the Federal Department of Agriculture. This custom has grown up and continued because it has been found that there is considerable general interest in these measures as unique indicators of current opinion as to the relative importance of the different lines of the Department's work, and especially as forecasts of its prospective activities in the fiscal year just ahead. A further justification lies in the complexity of this legislation and the consequent difficulties which are often encountered in making comparisons directly from successive appropriation acts without more or less interpolation and interpretation.

The latest of these measures, signed by President Coolidge February 16, 1929, and covering the fiscal year ending June 30, 1930, conforms in a general way to the standardized arrangement of items and phraseology which is being evolved from year to year, but there are many deviations for which due allowance must be made. Considerable supplementary legislation carried in other acts must also be taken into account, and as usual the so-called "permanent, special, and indefinite appropriations," which accrue annually to the Department without reenactment, must be included if a recapitulation of the Department's prospective resources is attempted.

The appropriation act itself provides $144,511,554. To this must be added $11,048,436 from the permanent appropriations, funds aggregating $1,435,040 available from a reappropriation of certain unexpended balances, and supplementary funds carried in the Second Deficiency Appropriation Act of March 4, 1929, totaling $460,000. These items collectively aggregate $157,455,030, a net decrease of $11,052,573.88 from the corresponding items similarly assembled for the previous year.

The situation as regards agriculture, however, is again obscured by the large proportion of the Department's appropriations which is devoted to road construction. The roads funds for the fiscal year 1929 total no less than $89,851,294 and for 1930 $82,000,000, although the actual decrease will be somewhat smaller since a part of the 1929 funds will be available for expenditure in 1930. Well over 50 per cent of the Department's budget and an even larger share of the apparent curtailment of funds thus pertain to the roads work alone, but as the roads appropriations are usually governed largely by the state of completion of the various cooperative projects their variation from year to year is without general significance.

For its other work the Department will receive in 1930 $75,455,030. This also is an apparent decrease by $3,201,279.88 from the appropriations of 1929, but this arises chiefly from the omission of two emergency appropriations. One of these carried $6,000,000 for seed, feed, and fertilizer loans to farmers in storm and flood stricken areas of Virginia, North Carolina, South Carolina, Georgia, Florida, and Alabama and the other was a reimbursement of $1,200,000 for fighting forest fires. Disregarding these emergency items, there will be available a net increase of $3,998,720.12 for general purposes, and this will be further augmented by a number of unexpended balances of indefinite amount from the 1929 appropriations.

This net increase is the resultant of numerous enlargements and deductions distributed throughout the legislation, the addition of some new projects and the discontinuance of a few others, but approximately half of it represents a continuation by Congress of its recent policy of expanding and strengthening scientific research in agriculture and forestry. The largest single item is the increase of $480,000 to the State experiment stations under the Purnell Act, together with $15,000 additional for Purnell work in Hawaii. This leaves about $1,500,000 for increased research by the Department itself. This amount has been widely apportioned, but among the larger projects thus to be provided for may be mentioned a new item of $160,000 for investigations of the causes and means of prevention of soil erosion and the conversion of rainfall by terracing and other means; $300,000 for intensive entomological and plant breeding work to combat leafhoppers and the resultant curly top disease of sugar beets and other important truck crops; $160,000 for forestry research; $80,000 for investigations in the Bureau of Animal Industry; $97,000 for research in the Bureau of Dairy Industry; $325,000 for investigations in the Bureau of Plant Industry and $85,000 additional for eradication work under that bureau on the phony disease of the peach in the South; $100,000 for projects of the Bureau of Chemistry and Soils exclusive of soil erosion, $100,000 additional for entomological and economic studies of the European corn borer, $128,000 for other entomological research, $45,000 for investigations by the Bureau of Agricultural Economics, $27,000 for agricultural engineering research, and $20,000 for the Bureau of Home Economics.

This material development of the Department's research program has been made possible by the greater stress put upon it by the

Department itself in making up its estimates, the cooperation of the Bureau of the Budget, and the sympathetic support of the appropriate committees in Congress. It has also been greatly aided by the interest and approval manifested by President Coolidge, who in his final message on December 4, 1928, expressed himself as follows:

"I can not too strongly commend, in the field of fact finding, the research work of the Department of Agriculture and the State experiment stations. The Department now receives annually $4,000,000 more for research than in 1921. In addition, the funds paid to the States for experimentation purposes under the Purnell Act constitute an annual increase in Federal payments to State agricultural experiment stations of $2,400,000 over the amount appropriated in 1921. The program of support for research may wisely be continued and expanded."

Outside the field of research, one of the largest individual items of increase is the provision of $500,000 additional for cooperative extension work as authorized by the Capper-Ketcham Act of 1928. Other increases of note are $549,780 for the tuberculosis eradication campaign, about $176,000 for an extension and development of the market news service, $170,000 for the control of plant diseases and insect pests, and $466,000 for weather forecasts with special reference to aerology.

Another class of increases is provided to meet certain augmented costs of operation. One of these provides approximately $100,000 for the Office of Information. Of this amount $10,000 is necessitated by a comptroller's decision that blank and stenographic notebooks hitherto purchased out of the individual bureau appropriations must hereafter be charged against the Department's printing funds. The remainder represents the first increase in the allotment for departmental printing for several years. During this period printing costs have been materially increased, as in the case of the *Record*, where the resulting deficit is now being avoided by the omission of the detailed table of contents. In the Department as a whole, there has been much congestion of material awaiting publication, particularly in the more technical series, and it is hoped that this increase will make it possible to overcome some of the arrearages in bringing before the public the results of its research program.

A much larger increase and one affecting nearly every item in the act has come from the general increase in compensation of employees provided under the Welch Act since July 1, 1928. The cost of these salary adjustments for the current year has been largely met by a deficiency appropriation of $2,066,818, while the estimate for 1930 is $2,527,697. The appropriation act supplies a total of $2,342,549 for this purpose, prorated among most of the individual allotments, but in a few instances the cost must be absorbed by the existing appropriations, and here it will operate to diminish the funds available for other purposes.

Taking up the allotments to the individual offices and bureaus, the funds under the Office of Experiment Stations will aggregate $4,737,000. Of this amount $1,440,000 represents the usual payments to the States under the Hatch and Adams Acts, $2,880,000 the corresponding allotments under the Purnell Act, and $15,000 the initial payment to Hawaii under the legislation of May 16, 1928. extending these acts to that Territory. In accordance with the terms of the Purnell Act, the funds thereunder receive their final increase of $480,000, making the quota of each State thereafter $60,000 per annum and the entire Federal Appropriations to the stations $90,000 per State per annum.

The appropriation for the Office itself is $402,000. Of this amount $10,000 is an increase to provide for additional services in connection with experiment station administration, while $5,320 represents a new project, the formal cooperation of the Department with the Union of American Biological Societies in the publication of *Biological Abstracts.* In the past this periodical, the main offices of which are located in Philadelphia, has been more or less handicapped in making adequate contacts with some of the literature dealing with the biological sciences in their applications to agriculture. Plans now being formulated look toward the amelioration of this condition by utilizing this grant largely for additional personnel to examine the publications received by the Department Library and arrange for the abstracting for *Biological Abstracts* of such basic material as is pertinent to its field. This service by the Department will also be supplemented under a grant to the library itself of $5,000 additional for the purchase of periodicals primarily for use in such abstracting. Meanwhile *Experiment Station Record* will continue the practice instituted some months ago of supplying to *Biological Abstracts* advance copies of its abstracts of all publications issued by the Department and the State experiment stations. It is expected that in these various ways representation in *Biological Abstracts* of the more fundamental contributions to agricultural science will be greatly facilitated.

The allotment for the support of the experiment stations in Alaska, Hawaii, Porto Rico, the island of Guam, and the Virgin Islands is $247,000. This is an apparent net increase of $600, but does not take into account an emergency grant of $12,500 to the Porto Rico and Virgin Islands stations carried in the First Deficiency Act of 1929 for repairs to station property damaged by the hurricane of September, 1928. There is an actual increase of $3,160 to provide for an extension agent in Guam and $3,080 for a veterinarian and animal husbandman in the Virgin Islands. On the other hand, the Alaska and Hawaii Stations will receive reductions of $2,100 and $2,220, respectively, in their general funds because of the salary readjustments previously referred to and the Hawaii station a further reduction of $10,000 in consequence of a transfer of its extension work to the University of Hawaii.

The Extension Service receives a total of $9,354,936. This is a net increase of $126,225, the omission of the $400,000 emergency appropriation for assistance in rehabilitating farm lands in flood devastated regions being more than offset by the $500,000 additional allotment to the States for extension work under the Capper-Ketcham Act. An increase of $9,560 is granted for more adequately meeting the requests of State and interstate fairs for educational exhibits, and one of $4,400 for cooperation with additional States in farm forestry extension under the Clark-McNary Act.

Reference has already been made to the increased allotment to the Weather Bureau, the available funds for which will aggregate $3,503,400. Of this amount $800,000 is for aerology alone. The principal change of significance as regards agricultural meteorology is the inauguration of a specific fruit frost warning service in the citrus sections of the Southeastern States, for which $7,500 has been made immediately available but continuing during 1930.

The total for the Bureau of Animal Industry, including reappropriations of $369,800, is $15,502,870, a sum which exceeds the appropriations for the entire Department for any fiscal year prior to 1912. The meat inspection will receive $5,600,000 and the tuberculosis campaign $6,361,000. The latter project accounts for the larger part of the net increase for the bureau of $621,146, and is in part the resultant of new legislation whereby the maximum indemnity rates for slaughtered cattle have been raised from $25 per head for grades and $50 for purebred stock to $35 and $70, respectively. Other increases include $15,000 for national poultry standardization work in cooperation with the States, $5,000 for work with milk and Angora goats, $10,000 for the improvement of facilities at Beltsville, Md., $38,155 for the investigation of bovine contagious abortion, $5,280 for liver fluke studies, $3,340 to complete the eradication of dourine on Indian reservations in Arizona, and $4,685 for miscellaneous pathological work on poultry diseases. Mention should also be made of a special appropriation of $25,000 carried elsewhere in the act for the preparation of an exhibit for the Fourth World's Poultry Congress to be held in England in 1930.

The Bureau of Dairy Industry receives $649,800, an increase from $546,900. A station is to be established at Lewisburg, Tenn., under an act approved May 29, 1928, for investigations and demonstrations of dairy problems and practices, and for this purpose $50,000 is appropriated. Increases ranging from $2,500 each for studies of the utilization of dairy products and the purchase of proved bulls in connection with dairy breeding work to $10,000 each for the installation of milking machines at the field stations and the extension of factory studies of cheese manufacture are also provided.

The new total for the Bureau of Plant Industry is $4,965,343, an increase of $332,410, mostly for research distributed over 20 items. The largest of the new projects is that for the eradication of phony disease of peaches, carrying $85,000. For the inauguration of shelter belt and horticultural work in the southern Great Plains area, authorized by an act approved April 16, 1928, $35,000 is granted. Other items include $35,000 for an investigation of European larch canker; $9,373 for an expansion of studies of cotton root rot and cotton wilt; $29,920 for breeding disease-resistant hard red spring wheats and $8,950 for studies of foot rot of wheat and virus diseases of cereals; $49,348 for breeding and agronomic work with sugar beets with a view to obtaining resistance to curly top; $50,000 for investigating the handling, transportation, and storage of fruits and vegetables from California and Arizona and of eastern-grown apples in export shipments; $25,000 for cultural and disease studies of pecans, $5,000 for black walnut investigations, and $15,000 for nut research in the Pacific Northwest; $10,000 for a study of boron-resistant rootstocks for citrus and other orchard fruits and $7,500 for an investigation of perennial canker of fruit in the Wenatchee Valley; $10,000 for bulb disease investigations; $20,000 for the improvement of seed potatoes; and $24,980 for securing wilt-resistant varieties of alfalfa from Turkestan and studies of alfalfa failures in the Mississippi Valley. On the other side of the ledger is a decrease of $25,453 through the abandonment of rubber work in the Philippines and its curtailment in Panama and Haiti.

The Forest Service receives $24,469,780, of which $8,000,000 (an increase of $500,000) is for the construction of forest roads and trails, $2,000,000 for the acquisition of additional lands at the headwaters of navigable streams, and $1,400,000 (an increase of $184,098) for cooperative fire protection. Considerably greater provision is made for research as authorized by the McSweeney-McNary Act of 1928, some of the increases including $29,593 for a study by the Lake States Forest Experiment Station of methods of making more productive the forest lands of the region and for general sylvical investigations, $40,000 for a forest survey and $25,000 for other economic studies, $14,320 for range investigations, and $42,404 for a number of studies of forest products and their utilization.

For the Bureau of Chemistry and Soils there is an increase from $1,385,874 to $1,655,075. This includes $160,000 for the soil erosion studies, which are to be carried on by several bureaus. There is also an increase of $3,635 for the soil survey, $22,814 for soil fertility studies, and $1,820 for an expansion of soil chemistry investigations. Under a provision in the Second Deficiency Act the Department also receives $17,000 for the fiscal year 1929 and $25,000 for 1930 for cooperation with the Department of Commerce in the development of improved methods of recovering potash. The bureau is given increased provision for studies of insecticides and fungicides, $25,000 being made available for work with the codling moth and $10,000 for extending it to other pests, including methods for removing spray residues from fruits and vegetables. For naval stores research $16,160 is allotted, for honey work $7,500, and for the dust explosion studies $4,512, but an increase of $10,000 the previous year for farm fire studies has been eliminated.

The Bureau of Entomology will receive $2,185,790, an increase of $117,344. Among the insects to which additional attention will be given are the oriental fruit moth, the Mexican bean beetle, the pink bollworm, and the white and black citrus flies, for which $15,000, $5,000, $10,000, and $6,000, respectively, are provided to import and establish parasites, insects affecting bulbs in the East to which $7,500 is allotted, and strawberry aphids, the sugar beet leafhopper, wireworms, the western pine bark beetles and other forest insects, crickets in northwestern Colorado, and the buzz or eye gnats in California and the Gulf States, for which from $2,000 to $18,000 will be available. An allotment of $5,000 for spraying blueberries in Maine by airplane for maggot control was eliminated, but a study of hydrocyanic acid gas fumigation in southern California, a comparison of methods of disinfecting nursery stock to facilitate quarantine operations, and an attempt to devise methods of disposing of wastes from cotton gins and oil mills as a means of preventing the spread of the pink bollworm and the Thurberia weevil are authorized with appropriations of $4,160, $3,000, and $6,000, respectively. The funds for taxonomic studies are increased by $5,000, and $17,000 is granted for an investigation of insect pests affecting flour, primarily because of an emergency which has developed in the export trade.

For the Bureau of Biological Survey there is a net increase of $295,768, making its new total $1,509,166. This is mainly for the maintenance and development of the various mammal and bird reservations and the enforcement of the migratory bird act, but $5,000 additional is provided for economic investigations in connection with predatory animal control in Alaska and $7,957 for studies of the relation of wild animals to forest growth as authorized by the McSweeney-McNary Act.

Exclusive of its funds for road construction, the Bureau of Public Roads will receive $495,400. This is an increase of $30,692, entirely for agricultural engineering projects. These include $6,000 for a study of water requirements of crop plants in Arizona and Utah, $2,150 for enlarging the study of the engineering phases of soil erosion, $5,000 for an inquiry as to the possibility of reducing labor costs in growing sugar beets by the substitution of improved machinery for hand labor and $4,000 for a similar inquiry as to cotton, and $10,000 for a study of drainage methods in sugar cane lands in southern Louisiana.

The total for the Bureau of Agricultural Economics, $6,312,660, represents a net increase of $319,281. Most of this increase pertains to the bureau's market news inspection and statistical work, but $13,770 additional is available for a study of rural credits and taxation problems, $8,967 for a preliminary survey of problems connected with the marketing of cotton from the Southwest, and $12,260 for research and advisory work in cooperative marketing. An allotment of $9,999 has been made for an extension of the hay inspection service and $20,000 for the inauguration of a market inspection service on tobacco. The opening of an office at Marseilles is contemplated to establish marketing contacts with the Mediterranean region and other eastern points. For the market news service an increase of $176,082 will permit of extension at several points. The statistical work will be broadened by the organization of truck crop statistics on a more adequate basis, with an allotment of $49,820, while for the fiscal years 1929 and 1930 $30,000 will be available for the quarterly collection and publication of statistics as to stocks of leaf tobacco as provided in an act approved January 14, 1929.

The funds for the Bureau of Home Economics are enlarged from $148,037 to $167,500. Of this amount $10,000 is to be used in a revision of the well-known Bulletin 28 of the Office of Experiment Stations, originally issued in 1896 and entitled Chemical Composition of American Food Materials. Despite the many advances in scientific methods in the present century, this compilation has remained a most popular source of information in its field, no fewer than 81,745 copies having been sold in addition to an extensive free distribution. The bureau will also have available $3,284 for the employment of additional specialists for studies of food utilization and $6,000 for studies of the properties of wool used for clothing.

The work of the remaining branches of the Department will be continued on substantially the present basis. The Plant Quarantine and Control Administration will receive $3,110,620, the Grain Futures Administration $140,000, and the Food, Drug, and Insecticide Administration $1,537,300. An increase of $17,170 is made for the administration of the U. S. Grain Standards Act, $4,030 additional for the U. S. Warehouse Act, and $27,924 additional under the Food and Drugs Act.

The principal plant pests for which increased funds for quarantine and control are made available are the Mexican fruit worm, the pink bollworm of cotton, the Parlatoria date scale, the gipsy moth, the European corn borer, the Japanese and Asiatic beetles, and the phony peach disease. The special leafhopper research allotment of $230,000 has already been referred to, and an appropriation of $38,280, available for both 1929 and 1930, is provided for agronomic, chemical, pathological, and related phases of barley diseases and feeding experiments with diseased barley grains. For corn borer research a special fund not to exceed $150,000 of the unexpended balance for the original appropriation of $10,000,000 in 1927 is made available for the fiscal year 1929. This represents an increase of $100,000, of which $4,000 is allotted to the Bureau of Chemistry and Soils for the extension of work in the economic utilization of corn cōbs, stalks, and other wastes, $6,000 to the same bureau for expanding its work on insecticides and repellents, $40,000 to the Bureau of Entomology principally for parasite work, and $25,000 each to the Bureaus of Agricultural Economics and Public Roads, the former for economic readjustment studies and the latter for the development of corn borer machinery.

The passage by Congress of the new appropriation act followed close upon the usual comprehensive hearings by the Bureau of the Budget and the House and Senate committees and occasioned little discussion at any stage. This absence of controversy seemed less to imply a diminution of interest in the measure than a tacit acceptance of its general program and policies. Because of differences of opinion on a number of matters unrelated to agriculture, some uncertainty was felt at one stage as to the fate of the two deficiency bills in which were embodied a number of important items for the Department, but ultimately these too were enacted before the ending of the Seventieth Congress on March 4, making available a period of nearly four months of planning and preparation before the commencement of another fiscal year. With larger appropriations for its primary activities than ever before, an increased emphasis upon research, and an unusually long interval for organizing its work to the best advantage, the Department thus finds itself in an exceptionally favorable position to press onward under its new leadership.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Biochemical laboratory methods for students of the biological sciences, C. A. MORROW (*New York: John Wiley & Sons; London: Chapman & Hall, 1927, pp. XVII+350, figs. 29*).—This manual represents the University of Minnesota laboratory course in biological chemistry and "is the outgrowth of nine years' experience in biochemical laboratory methods." Since many of the students for whom the course was designed "have not been specifically trained as chemists . . . it has seemed wise to give the experimental methods in great detail. The selection of the experiments offered has been based upon the idea of giving the student fundamental chemical principles as they relate to living processes. The materials which have been suggested for use in the experiments are chosen largely from plant sources, because the majority of the students have been primarily interested in this field. The general principles which the experiments illustrate, however, apply equally well to biological phenomena in general. In short, the course has been designed for training in research methods."

The chapter headings include the colloidal state, physical chemical constants of plant saps, hydrogen-ion concentration and buffer action, proteins, carbohydrates, glucosides, fats and allied substances, enzymes, and plant pigments. Each chapter is divided under subtopics into a number of sections, each of which includes from one to several experiments.

The work consists largely in the preparation and purification of biochemical substances, but numerous experiments on the properties of natural substances and systems and on artificially prepared mixtures illustrative of such properties, on qualitative tests, and on quantitative determinations are also given.

A study on pepsin [trans. title], H. PENAU and J. PLÉ (*Jour. Pharm. et Chim., 8. ser., 7 (1928), No. 12, pp. 601–606*).—Citing a number of investigators as having found the use of alcohol for the precipitation of zymases in the purification of pepsin to lead in a large number of cases to a more or less rapid inactivation of the enzymic property of the product under treatment, the authors proceed to an account of experiments to ascertain the possibilities of acetone as a substitute for alcohol in the purification of pepsin, and to define optimum conditions of time, temperature, and H-ion concentration for the use of this reagent. The effects of various periods of contact were noted at pH readings of 2.5, 3.6, 4.7, 5.4, 6.0, and 7.0. The weight of the precipitate and its proteolytic activity are reported for the various exposures at each of these pH readings.

It was concluded that 9 parts of acetone could be added to 1 part of the pepsin solutions used (from 1 to 10 per cent), practically without altering the activity of the preparation during 48 hours of contact, when the acidity of the solution was equivalent to a pH reading of about 2.5, the figure accepted by the authors as the isoelectric point of pepsin. With appreciable departure from the last-named pH reading, the activity of the product is shown by the experimental results given as decreasing progressively with increasing distance of the pH adjustment from the optimum. This effect is the more noticeable in the figures representing the more prolonged exposure of the precipitate to the action of the acetone. The destructive effect is also shown as developing the more rapidly on the acid side of the optimum point.

A new reagent for the detection of oxycellulose, W. F. A. Ermen (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 10, pp. 303–305*).—"What is required in a good reagent for oxycellulose is an easily reducible, more or less colorless substance, which will leave a highly colored deposit without staining the unaltered cotton."

The reagent proposed for this purpose consists of solution A, ferric sulfate 20 gm., ammonium sulfate 25 gm., and water to make 100 cc.; and solution B, potassium ferricyanide 33 gm., and water to make 100 cc., these solutions being kept separately and in the dark. The test is made by adding 5 cc. of each solution to 250 cc. of boiling water and immersing the sample. The sample is rinsed after one minute's treatment, first in dilute sulfuric acid, then in water. "Any oxycellulose present will be stained a deep blue."

Criteria of the validity of analytical methods used by cereal chemists, A. E. Treloar and J. A. Harris (*Cereal Chem., 5 (1928), No. 5, pp. 333–351*).—The discussion comprises (1) criteria of the differences in analytical yields, under which caption are considered (*a*) the direct comparison of the differences of mean yields with reference to their probable errors, (*b*) a criterion of the deviation of the yield of a given method from the mean yield of a series of methods, and (*c*) an application of the method of intraclass correlation; and (2) criteria of differences in the consistency of analytical results obtained by different methods, this latter subject being taken up under the subtopics (*a*) the direct comparison of standard deviations and coefficients of variation and (*b*) a comparison of the variability of a subsample with that of the sample from which it is drawn. The points made in the analysis are illustrated principally by means of studies of the figures obtained in a group of wheat ash determinations and a large number of determinations of wheat protein content.

"The two criteria of fundamental importance for determining the validity of analytical methods when these are based solely on samples of unknown composition seem to us to be average yields and differences of average yields of the same constituent of wheat or flour as determined by two or more methods, [and] consistence of the results obtainable by any method of determining a constituent when applied by various workers. In both cases the significance of differences in the results due to various methods must be tested by comparison with their probable errors."

Though the primary purpose of the paper is the indication of biometric methods generally applicable to the testing of the validity of results of analytical procedures, the illustrative computations presented are considered to have brought out certain "main points concerning data already assembled," among which are the following:

"The determination of protein in the flour is shown to be the most refined analysis among the three (moisture, ash, and protein), so far as consistency of results is concerned. Providing adequate digestion is given, no one method of determining protein, as given in the reports, has been shown to be significantly different from any other method in the consistency of results obtained. In no case has it been demonstrated that significantly higher yields are obtained by digesting longer than 60 minutes. This does not necessarily mean that higher yields by the use of longer periods of digestion may not be demonstrated by more extensive studies with careful standardization of all factors. . . .

"The glycerol-alcohol method of determining ash in flour gives significantly higher average yields than the straight muffle method, and it also tends to give significantly more variable results. Greater variability, with different analysts, is found in ash determinations upon flour than in protein or moisture analyses. . . .

"The analytical determinations given in the reports studied show that there are very definite 'systematic errors' or personal or laboratory equation among analysts. The demonstration of the existence of this systematic error is important for two reasons: (1) It shows that the concordance of results obtained by the same worker, using two different methods of making the same determinations, furnishes no real proof that he is really reporting the true value for his sample; (2) this 'systematic error' must be taken into account in determining the significance of the difference in the average yields obtained by two methods, differences always having a lower probable error (and a higher probability of significance) when correction for this factor is made."

A critical study of some methods used in flour colorimetry, F. V. Hooft and F. J. G. de Leeuw (*Cereal Chem., 5 (1928), No. 5, pp. 351–365*).—The method for rapid extraction by means of gasoline, as proposed by Coleman and Christie (E. S. R., 55, p. 611), is credited with ease of manipulation when use is made of a shaking machine and with the prevention of all evaporation of the solvent by making possible the use of tightly closed glass-stoppered bottles. The special colorimeter of Kent-Jones and Herd (E. S. R., 58, p. 805) is admitted to be less tiring to the eye than is the Duboscq instrument, but the last-named is given preference because with the Kent-Jones apparatus " a reading takes much more time and is no more accurate."

Noting that the use of standard solutions having components different from those of the solutions to be tested is a source of error, the authors state that "this error does not appear in separate gasoline value tests of the same sample of flour because in each instance the same error is made. But results are very misleading when a flour is compared with another flour that has twice the amount of carotinoid pigments. The last flour will give a gasoline value that is between two and three times as high. We have shown that this error is probably due to the differences in H-ion concentration of the standard solution, because it could be largely corrected by the use of buffer solutions instead of distilled water."

Sprague's solutions (E. S. R., 58, p. 26) of organic dyes are said to match the colors of gasoline solutions of flour pigments "much more closely than any of the inorganic standard solutions," but it is noted that "not all samples of the organic dyes have the same purity and therefore not the same color value."

It is considered advisable "to use buffer solutions of a known H-ion concentration for the preparation of the official standard solutions of potassium chromate." It was found that "the extraction with alkaline methyl alcohol does not, in the 16 hours specified by Kent-Jones, give a complete extraction of all the coloring matter soluble in this solvent," thorough shaking after the extraction, or an extraction period of approximately 40 hours, having been necessary to constant results in the experiments of the authors.

Some oxidizing effects of flour bleaching, E. B. Working (*Cereal Chem., 5 (1928), No. 5, pp. 431–435*).—The author contributes from the Kansas Experiment Station a study of the properties of flours bleached with 2.25 and with 7.5 gm. per barrel of nitrogen trichloride; with chlorine containing 0.5 per cent of nitrosyl chloride, 45 and 67 gm. per barrel; and with 18 and 27 gm. per barrel of benzoyl peroxide. "These samples were baked the day after milling and again three weeks later." The results of the experiments and the conclusions drawn are stated in part in the following terms:

The bleaching of flour has developed along such lines that the actual destruction of color is scarcely more important than the accompanying effects generally known as "maturing." Theoretically, this maturing should be similar to the development obtained in dough by the use of oxidizing agents. The use of lactic acid and a heavily overbleached flour will give the same results in developing a dough for a no-dough-time baking method as will the use of acid with sodium chlorate or other oxidizing agents.

The quality of normal flour improves for some time after milling, reaches a maximum, and then begins to deteriorate. Preliminary experiments and general observation indicate that this deterioration begins sooner in bleached flours than in unbleached. Thus it seems possible that large bakeries could prolong the period of maximum quality in their flour by buying unbleached flour and bleaching shortly before use. In this way the severity of the oxidation could be accurately adjusted to the needs of the flour at the time and to the fermentation schedule desired.

Factors influencing checking in biscuits, J. A. Dunn and C. H. Bailey (*Cereal Chem., 5 (1928), No. 5, pp. 395–430, figs. 15*) —A hypothesis to account upon a physicochemical basis for the "checking" of hard sweet biscuit is elaborated, and experiments of considerable variety by means of which the suppositions were confirmed are detailed.

It is concluded, in brief, that when the biscuit are taken from the oven the inner portion of each biscuit is appreciably more moist than is its edge; that during the curing period this moisture gradient is diminished by the tendency of the biscuit to "come into hygroscopic equilibrium with the relative humidity of the curing chamber;" and that the portions of the biscuit which absorb moisture in reaching this equilibrium swell while those parts of the mass which lose moisture in the same period shrink, the opposing forces thus set up causing the checking strains.

It is noted that the initial moisture gradient can be regulated by the baking procedure. However, as indicated by the hypothesis upon which the work was based and established by experimental trial, not only thorough baking but also, in order of importance, curing in a moist atmosphere, keeping the biscuit warm as long as possible, thorough mixing, and the inclusion of some invert sugar in the formula are conditions of the prevention of checking in hard sweet biscuit, snaps, and sugar cookies.

The determination of casein in milk by an approximately iso-electric precipitation, H. C. Waterman (*Jour. Assoc. Off. Agr. Chem., 10 (1927), No. 2, pp. 259–263*).—"When equal volumes of various milks are treated with a fixed volume of an acid having physical properties optimal for buffering at the desired pH value, a close agreement among the pH values of filtrates is not obtained. Buffering salts are formed, but they are formed from milk constituents that vary not only in total but in relative quantity." In support of this statement pH measurements of the filtrates from precipitations of casein by Official Method No. 1 (E. S. R., 55, p. 11) are cited, the figures ranging from pH 4.09 to pH 4.21, while the generally accepted isoelectric point for casein is stated as in the neighborhood of pH 4.7. It is argued that a reagent in itself highly buffered would, if suitably adjusted, not only precipitate the casein from all milk samples at approximately the same pH value and at an average value much nearer the isoelectric point than does the Official method above noted, but also would avoid strong local overacidification since it would not need to have a pH value much below that required in the final mixture. A reagent of pH value 4.61 was used. The procedure given below secured the precipitation of casein from samples of milk ranging in pH value from 6.73 to 5.39 within the range pH 4.75 to pH 4.68.

"*Reagent.*—Pipet 250 cc. of normal acetic acid into a 1,000-cc. flask. Add 125 cc of normal, carbon-dioxide-free sodium hydroxide. Make up to 1,000 cc. with carbon-dioxide-free distilled water and mix thoroughly.

"*Determination.*—Pipet 20 cc. of the sample into a 100-cc. flask. Add 50 cc. of the reagent, mix, make up to volume with distilled water, and shake well. Set the flask in hot water (50–60° C., not over 60°) and let stand 15 minutes. Cool to room temperature and filter. Use a double folded paper, returning the filtrate once or twice to the filter; then filter once through a hardened paper. Determine nitrogen (A) in 50 cc. of the clear filtrate, and determine total nitrogen (B) in 10 cc. of the milk. 6.38× (B—A) = casein in 10 cc. of the milk. Report grams of casein per 100 cc. of milk, or divide the grams per 100 cc by the density of the milk, and report as percentage by weight."

Application of the Stahre reaction to the accurate determination of citric acid, B. G. Hartman and F. Hillig (*Jour. Assoc. Off. Agr. Chem., 10 (1927), No. 2, pp. 264–272*).—This contribution from the Bureau of Chemistry and Soils, U. S. D. A., reports the adaptation by a study and adjustment of the details of the reaction, conditions, etc., of the Kunz modification of the Stahre reaction as recommended by Dunbar and Lepper (E. S. R., 55, p. 11). It is noted that analysts have had some difficulty with the determination, more especially with its application to small quantities of citric acid, and that in the form above mentioned a minimum sample content of 50 mg. of citric acid is specified. Among the possible sources of error considered are the tendency of the pentabromacetone (the desired quantitative end product) to separate during the bromination-oxidation procedure as an oil, and, if secured in a suitable crystalline condition, to volatilize appreciably at room temperature during drying.

Detailed experiments were therefore made to ascertain under what conditions this and other difficulties might be obviated. Earlier observations to the effect that such other fruit acids as tartaric, malic, oxalic, and benzoic acids do not interfere in the quantitative application of the Stahre reaction for the determination of citric acid were experimentally confirmed. As a result of this work and other experience with the method given below, it was found that "even with a quantity of citric acid so small as 4.5 mg the quantity of pentabromacetone is such that after calculating its equivalent of citric acid and making allowance for the loss through solubility of the pentabromacetone in the reaction mixture, the result is not very far from the truth." The solubility of the pentabromacetone in the reaction mixture was found to be equivalent to 1.7 mg. of the anhydrous citric acid per 100 cc.

"*Reagents.*—Potassium bromide solution—dissolve 15 gm. of potassium bromide in 40 cc. of water. Potassium permanganate solution—dissolve 5 gm. of potassium permanganate in water and dilute to 100 cc. Ferrous sulfate solution—dissolve 20 gm. of ferrous sulfate in 100 cc. of water containing 1 cc. of concentrated sulfuric acid. Bromine water—freshly prepared saturated solution. Asbestos—treat asbestos of the amphibole variety as directed in the Official methods. Purify further by permitting it to be acted upon by the reagents used in the determination of citric acid and in a manner analogous to that used in the actual determination.

"*Determination.*—To 100 cc. of the citric acid solution add exactly 10 cc. each of dilute sulfuric acid (1+1) and bromine water. Allow to stand 10 minutes. If a precipitate is formed, filter. To 100 cc. of the filtered or unfiltered solution, add 5 cc. of the potassium bromide solution and about 0.3 gm. of the purified asbestos. Heat the mixture to 48–50° C. and maintain this temperature for five minutes. Now add at once and all at one time 15 cc. of the potassium permanganate solution and allow to stand for 10 minutes, shaking occasionally. If the liquid overlying the separated manganese dioxide is not colored brown, add more potassium permanganate solution. Cool the mixture in ice water and add 40 cc. of ice-cold ferrous sulfate solution. If the manganese dioxide has not been completely dissolved, add more ferrous sulfate solution. Note the volumes of the various solutions added. Shake for five minutes, cooling in ice water occasionally to keep the mixture thoroughly chilled. Place in a refrigerator overnight. Filter by decantation on to a thin, tightly tamped pad of asbestos in a Gooch crucible. Transfer the contents of the flask to the crucible with the filtrate. (It is important that the filtering operation be completed as quickly as possible.) Now wash the contents of the crucible at once with three portions of 20 cc. each of ice-cold sulfuric acid (1+100) and three portions of 20 cc. each of ice-cold water. Immediately dry the precipitate by aspirating with dry air until constant weight to within 0.3 mg. is obtained. Dry the air by passing it through sulfuric acid and soda lime and finally filter through cotton. Provide an intake tube for the air and a delivery tube to connect with the Gooch crucible that have small perforations. Suck the air through the system at a slow rate. For a seal between the drying apparatus and the cup of the crucible clamp on to the cup a large rubber stopper carrying the air delivery tube. Hold the stopper in place by means of a ring clamped to a ring support. If the drying can not be undertaken at once, place the crucible in the refrigerator. To remove the pentabromacetone treat the contents of the crucible with three portions of 20 cc. each of alcohol and three portions of 20 cc. each of ether. Aspirate with dry air to constant weight and reweigh. Multiply the difference in the weights by 0.424 to obtain the grams of anhydrous citric acid in the aliquot taken. Correct for the solubility of pentabromacetone by adding to the citric acid thus obtained 1.7 mg. for each 100 cc. of the reaction mixture."

The estimation of terpin hydrate in terpin hydrate elixir, A. G. MURRAY (*Jour. Assoc. Off. Agr. Chem*, *10* (*1927*), *No. 2*, *pp. 257–259*).—"In the following method, which was found to yield the most satisfactory results, it will be noted that no account is taken of the essential oil that the official elixir contains, as the error occasioned by it is too small to be significant. If, however, it is desired to avoid the presence of the volatile oil in the residue, it can be readily removed by a single preliminary extraction with a small volume of petroleum ether. The method is as follows:

"Dissolve 20 gm. of common salt in 100 cc. of water, or if more convenient add one volume of water to three volumes of a saturated aqueous salt solution. To a convenient measured volume of the sample of elixir add the prepared salt solution until the alcohol content is reduced to about 10 or 15 per cent by volume. Shake out with four portions, one-fourth volume each, of chloroform containing 5-7 per cent alcohol by volume. Wash each portion of the solvent successively through 5 cc. of the prepared salt solution. Filter through a pledget of purified cotton into a tared beaker or small crystallizing dish, finally rinsing the cotton and the tip of the funnel with a little alcohol. Evaporate with the aid of a blast and without the application of heat. Wipe off any moisture that may have collected on the outside of the dish and allow to stand 15 minutes before weighing."

With regard to the evaporation of the solvent from the extracted terpin hydrate, experiment demonstrated to the satisfaction of the author that evaporation on the steam bath with the aid of a gentle current of air, evaporation under reduced pressure without heat, and spontaneous evaporation were less satisfactory than the air jet without heat as prescribed.

The qualitative and quantitative determination of replaceable sodium in alkali and nonalkali soils, R. H. BRAY (*Jour. Amer. Soc. Agron.*, *20* (*1928*), *No. 11, pp. 1160–1166*).—The Kolthoff procedure (E. S. R., 58, p. 608) for the determination of sodium by precipitation as the triple salt sodium uranyl zinc acetate by means of an acetic acid-aqueous solution of uranyl and zinc acetates was found in a study made at the Illinois Experiment Station to be capable of satisfactory results in the determination of replaceable sodium extracted from soils by normal ammonium acetate. The salt was removed by ignition, the residue was taken up with a few cubic centimeters of hydrochloric acid, and this solution after dilution with water and neutralization with a slight excess of ammonia was boiled, filtered into a volumetric flask, and made up to volume when cool. To an aliquot from this solution, following evaporation to dryness and solution in 1 cc. of water, 10 cc. of the Kolthoff reagent was added to effect the precipitation; and the determination was completed practically as prescribed in the original account of the method.

As an adaptation of the method to rapid qualitative testing, 8 gm. of the soil to be tested was placed with 1 gm. of ammonium nitrate in a test tube and treated with 25 cc. of distilled water. The mixture was well shaken and filtered through a quantitative paper into a second tube, from which 1 cc. of the filtrate was transferred to a third tube and treated with 10 cc. of the uranyl zinc acetate reagent. "Within a few minutes a crystalline precipitate collects on the bottom of the tube if an appreciable amount of sodium is present." If the quantity of sodium be as great as 0.02 per cent of the soil sample, according to indications of the experiments on samples of determined sodium content, the test will be positive. The results of determinations of sodium by the quantitative method, together with the indication in each case of the qualitative test, are given for 46 soil samples.

METEOROLOGY

Climate as a weather combination [trans. title], E. E. Fedorov (*Nauch. Agron. Zhur.* (*Jour. Landw. Wiss.*), *4* (*1927*), *No. 3*, *pp. 171–190*, *figs. 2*; *Eng. abs.*, *pp. 188, 189*).—It is stated that the method of averages as used in the study of climatology is unsatisfactory in many respects, especially for practical purposes, and a method using frequency of occurrence of types is described. This is based on the fundamental idea that the climate of any place is an association of weather, the latter being considered as an indivisible phenomenon. Application of the method is illustrated in the climate of May and June at the Timiríãzevskaía Academy, based on data for the 20 years 1892–1911. The problem of the influence of weather as a unit on the plant is discussed with reference to favorable and unfavorable types.

Correlation of yield in oats with meteorological observations at the University College farm, Bangor, for the period 1903–1926, R. A. Roberts (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 2*, *pp. 297–316*).—In a study of data obtained in oat variety trials from 1903 to 1926, inclusive, on stony heavy loam, no correlation was established between yield and total rainfall or total accumulated temperatures for the whole growing season. It appears that the requirement with regard to total accumulated temperature for the growing season is not a fixed characteristic of any variety, but varies with any single variety from year to year. Two critical periods within the growing season were observed, one for the 20 days after emergence of the plants in spring and the other for the 14 days covering the emergence of the panicles.

"The significance of warm dry conditions after sowing is not as high as the significance of high rainfall and low temperatures for the emergence of the panicles, though in this area both are concomitant with high yield. . . . High temperatures, particularly if unaccompanied by precipitation in the later stages of ripening, may prove particularly damaging to grain yields. Drought periods, particularly from June onward, are likely to reduce yield, particularly if accompanied by high temperatures for the same period."

Instructions to marine meteorological observers (*U. S. Dept. Agr., Weather Bur. Circ. M (1925), pp. X+99, pls. 8, figs. 23*).—These instructions are restricted for the most part to essential observations which "make the smallest possible demands on observers consistent with the needs of the bureau in meeting its responsibilities for the issuance of forecasts and warnings, the procuring of data for publication on charts, and otherwise effectively carrying out its marine meteorological program."

In "an appreciation," C. F. Marvin calls attention to the great value of marine meteorological observations and of radiotelegraphic communication as means of binding together land and sea meteorology. A selected list of publications on general meteorology is given.

Instructions for airway observers (*U. S. Dept. Agr., Weather Bur. Circ. N (1928), pp. II+28, figs. 18*).—"The object of this pamphlet is to furnish airway observers with brief instructions for their guidance in installing the necessary equipment and taking, recording, and transmitting such weather observations as are necessary for the successful operation of airways"

Instructions for making pilot balloon observations (*U. S. Dept. Agr., Weather Bur. Circ. O (1928), pp. II+66, pl. 1, figs. 15*).—This is a revised edition, under a new title, of Instructions for Aerological Observers, published in 1921 (E. S. R., 50, p. 314), the instructions in the revised circular being confined exclusively to pilot balloon work.

SOILS—FERTILIZERS

Studies in the geology and mineralogy of soils.—I, A detailed study of a region characterised by diverse rocks and partly covered by glacial drift, R. HART (*Jour. Agr. Sci. [England], 19 (1929), No. 1, pp. 90–105, pl. 1, fig. 1*).—Results of mechanical and mineralogical analyses of the varied soils of a small area "typical of many Scottish hill-foot farms" are reported and discussed with reference to the geological derivation and physical and chemical properties of the soils.

Soil survey of Minidoka area, Idaho, F. O. YOUNGS ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1923, pp. III+859–902, pls. 8, fig. 1, map 1*).—The Minidoka area in southern Idaho includes 352,640 acres, mainly bench lands and terraces, with alluvial fan slopes along its southern boundary, and is provided with drainage by the Snake River varying in different parts of the section from excessive to inadequate. A part of the area is under irrigation.

The 22 soil types recognized in this report (prepared in cooperation with the Idaho University and Experiment Station) are classified into 11 series. Portneuf silt loam and its phases are predominant in extent, with a total of 37.6 per cent of the entire area surveyed, while unclassified areas of scabland 2.7 per cent, rough, broken, and stony land 1.2 per cent, and rough, mountainous land 0.8 per cent, are also listed.

Henry County soils, R. S. SMITH, E. E. DETURK, F. C. BAUER, and L. H. SMITH (*Illinois Sta. Soil Rpt. 41 (1928), pp. [2]+65, pls. 4, figs. 4*).—Situated in the northwestern part of the State and comprising a total area of 521,865 acres, Henry County, Ill., presents diversified surface features including a large terrace region, from flat to undulating, "with low hills where the wind has been active in drifting the sand," an undulating upland plain cut by various streams, and a hilly region "formed by the piling up of wind-blown material from the terrace."

The soils of Henry County as classified in this report are listed as individual types and grouped into four regional divisions of upland prairie soils (19.99 per cent of the entire area considered in this report), upland timber soils (12.82 per cent), terrace soils (23.48 per cent), and swamp and bottom land soils (13.50 per cent). The types more important in extent are a brown silt loam of the upland prairie group, 45.82 per cent, and a brown silt loam of the terrace group, 10.16 per cent.

Important soils of North Carolina, their distribution, composition, and plant food needs, C. B. Williams (*North Carolina Sta. Agron. Inform. Circ. 18* (*1928*), *pp.* [*4*]).—The Coastal Plain, Piedmont, and mountain provinces are stated to occupy 40, 38, and 22 per cent of the total area of the State, respectively. The predominant agricultural series represented in each of these provinces are listed; and the topics of the definite determination of the special fertilizer needs of individual soil types, some principal plant-food deficiencies of soils of the three provinces as represented in North Carolina, and the average composition of important soil types in the State, are then taken up.

The dispersion and mechanical analysis of heavy alkaline soils, A. F. Joseph and O. W. Snow (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 1, pp. 106–120, figs. 4*).—The Robinson pipette method (E. S. R., 49, p. 316) was found to be not as well suited as the so-called Sudan method (E. S. R., 47, p. 118) to heavy alkaline soils such as those of the Sudan. For such soils the authors conclude that "decantation methods appear essential, hydrogen peroxide unnecessary, acid pretreatment not essential, and sodium carbonate better than ammonia."

The properties of heavy alkaline soils containing different exchangeable bases, A. F. Joseph and H. B. Oakley (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 1, pp. 121–131, figs. 2*).—In experiments with clays and soils saturated with different bases, including calcium, magnesium, sodium, potassium, and lithium, it was found that claylike properties were exhibited most strongly in the case of lithium, sodium, and magnesium. Potassium was found to resemble sodium in its chemical relationship as indicated by base exchange, but was very different from it in relation to physical properties such as plasticity and permeability. "Using mixtures of one-half normal chlorides of two bases, calcium and potassium are absorbed in equivalent amount while the sodium absorbed is only one-sixth of the amount of either of the other two." No correlation between fine material in the soil and other physical properties was observed.

The influence of the replaceable bases on the soil solution formation in mineralized soils, F. Menchikowsky and S. Ravikovitch (*Soil Sci.*, *27* (*1929*), *No. 1, pp. 49–68, figs. 8*).—Examination of the water extracts of samples taken at various depths in the Ben-Shemen (Plain of Sharon), Djuania (Plain of Esdrealon), and Dagania (Valley of Jordan) soils indicated that the distribution curves of the cations in the extracts correspond to the replaceable base distribution. "These curves, which are the results of the hydrolysis phenomena, are more distinctly expressed in the case of soils possessing large absorbing complexes."

It was further found that "with the exception of one layer of the Dagania soils, the anions $PO_4^{\equiv}$ and $SO_4^{=}$ were absent in the soil extract. The amount of HCO_3^- and $SiO_3^{=}$ extracted from the soil was found to increase with dilution. Our observations show (*a*) that the influence of the water leads to the decomposition of the alumino-silicate nucleus of the colloidal complex, and (*b*) that this decomposition does not depend on absorbed Na. NO_3^- and Cl^-

bear the character of the anions of soluble salts. . . . The distribution of the cations in the soil extracts is not dependent on the degree of the increase of water in the soil. The cations are distributed in the same percentage in all extracts, and the appearance of each cation in the extract corresponds to the partial decomposition pressure of the compounds formed by the absorbed cation with the alumino-silicate group. Observations lead to the conclusion that in highly mineralized soils the composition of the soil solution relatively conforms with the composition of the replaceable bases in the soil colloidal complex. and to a certain degree reflects also the character of the same complex."

The relation between the total chemical composition of the soil and the water extract, W. O. ROBINSON (*Jour. Amer. Soc. Agron., 20 (1928), No. 8, pp. 793–801*).—This is a discussion collating and to some extent analyzing recent contributions to the chemistry of the soil. The paper, a publication from the U. S D. A. Bureau of Chemistry and Soils, takes the form of a discussion of the available analytical data, followed by sections on the effect of soil minerals upon the soil solution and on the effect of colloidal matter upon the soil solution.

Plant composition as a guide to the availability of soil nutrients, R. M. SALTER and J. W. AMES (*Jour. Amer. Soc. Agron., 20 (1928), No. 8, pp. 808–836, figs. 6*).—This is largely an analysis of data gathered from a number of previously published investigations and here presented in part in tabular and graphic forms designed to illustrate points taken up in the discussion.

"From a study of all the available data the authors do not consider the stalk tests for either potash or nitrogen requirements as sufficiently reliable to warrant their practical use under Ohio conditions." The Neubauer test (E. S. R., 50, p. 118) is included among the procedures considered. The paper is accompanied by a reference list of 40 items and is a communication from the Ohio Experiment Station.

A study of the nature of the nitrogenous compounds in fungous tissue and their decomposition in the soil, A. F. HECK (*Soil Sci., 27 (1929), No. 1, pp. 1–46, pl. 1, figs. 6*).—Under the heads of the occurrence and quantity of soil fungi, the activities of soil fungi (including the relation to energy materials and to nitrogen), composition of fungus mycelium (nitrogenous, carbonaceous, and cellulose material), and decomposition and nitrification of fungus tissue, this contribution from the University of Wisconsin discusses in considerable detail the work published in an appended reference list of 136 items.

The experimental work reported includes the collection of fungus tissue from natural habitats; the production of fungus tissue on synthetic liquid media; the separation and analysis of various chemical constituents of this material; laboratory and greenhouse experiments on the availability of fungus nitrogen, involving the study of the nitrification, numbers of bacteria, and apparent extent of fungus growth; the evolution of carbon dioxide and the quantities of ammonia present in relation to nitrate accumulation; the growth of oats with fungus mycelium as the source of nitrogen; etc.

It is stated in conclusion, following a more or less detailed account of the findings with regard to the proximate components of the mycelia studied, that "most fungus tissues decompose readily in moist soils. From 40 to 60 per cent of their carbon is liberated as carbon dioxide in 26 days. On decomposition the nitrogen which they contain is liberated as nitrate to the extent of from 30 to 42 per cent of the original amount during a period of 26 days. The balance is either not liberated or is again combined into a new fungus or bacterial substance. When there is no other energy material present, living fungus tissue liberates its own nitrogen by autolysis to even a greater extent than the dead tissue. The rate of mineralization of fungus nitrogen depends upon the amount and kind of energy materials present. When the energy material is simple the decomposition is largely bacterial with the liberation of large amounts of nitrate nitrogen, but when it is of a cellulosic nature, the action is to a great extent fungus with the liberation of little or no mineral nitrogen. The nitrogen in fungus tissue in the soil is as readily nitrified as, or even more rapidly nitrified than, that of other organic materials of similar nitrogen content."

On the influence of the carbon : nitrogen ratios of organic material on the mineralisation of nitrogen, H. L. Jensen (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 1, pp. 71–82, figs. 4*).—Wheat straw, sweet clover, blue lupine, barnyard manure, pea pods, alfalfa, and fungus mycelium having carbon: nitrogen ratios ranging from about 85:1 to about 10:1 were submitted to nitrification tests in an acid and an alkaline soil during a period of six months. The results indicated that the carbon: nitrogen ratio influences nitrification as much as does the soil reaction. In the alkaline soil 1 part of nitrogen for each 20 to 25 parts of carbon was nitrified very slowly, whereas the remainder was liberated quite readily. In the acid soil 1 part of nitrogen for each 13 to 18 parts of carbon was readily nitrified. The slow nitrification of the last 1.5 to 2 per cent of the nitrogen of barnyard manure observed suggests an explanation of the less complete utilization of nitrogen in manure as compared with that in artificial fertilizers.

Seasonal variation of nitrates in Willamette Valley soils as influenced by liming and cropping, W. V. Halversen (*Jour. Amer. Soc. Agron.*, *20* (*1928*), *No. 8, pp. 868–875*).—The Willamette silty clay loam of the Willamette Valley of Oregon is noted in this contribution from the Oregon Experiment Station as being one of the most important types of the valley. The present study of the influences affecting the nitrate content of this soil led the author to conclude that "low soil temperatures and excessive moisture retard nitrate formation during the winter and spring months to the extent that not more than a trace of nitrate can be found in soil under growing cereals. This humid season breaks suddenly into summer, and soon lack of moisture is the limiting factor. Lime stimulates nitrate production in fallow soils and also the nitrifying power of the soil as measured by its ability to produce nitrates from ammonium sulfate. Climatic factors which affect soil moisture and temperature are limiting factors which mask results and make it impossible to predict crop behavior. The complete disappearance of nitrates under growing cereals indicates the need of a fertilizing system which would increase the supply of nitrates during the winter and spring months."

Electrodialysis of soils.—III, Effect of different fertilizer treatments of soils on the bases and acids extracted by electrodialysis, H. Humfeld (*Jour. Amer. Soc. Agron.*, *20* (*1928*), *No. 11, pp. 1141–1159, figs. 3*).—Advantages of electrodialysis as compared with leaching out with neutral salt solutions for the determination of replaceable bases in soils are detailed and illustrated in the present installment of the soil electrodialysis series of the Iowa Experiment Station (E. S. R., 59, p. 114). Results of the electrodialysis of three soils of widely different types and treatment histories are considered to show "that satisfactory end points were secured with each soil."

The data obtained, which are presented in the form of 24 tables of analytical findings and three graph figures, are considered to demonstrate "that fertilizer treatments over a term of years have a measurable effect on the amounts and kinds of extractable acids and bases. The effect of treatments of rock phosphate on the phosphorus and of superphosphate (acid phosphate) on the phosphorus and sulfur were especially striking. Applications of farm manure seemed to cause a slight decrease in the total bases extracted. A change of soil type within a range of plats may have a greater effect on the amounts of extractable acids and bases than any of the treatments."

The drift in potential of the quinhydrone electrode, L. D. Baver (*Jour. Amer. Soc. Agron., 20 (1928), No. 11, pp. 1125–1140, fig. 1*).—Noting that most of the published objections to the use of the quinhydrone electrode for the determination of the H-ion concentrations of soil suspensions have been based upon the drift in electrode potential practically always observed in such determinations, and citing a considerable number of opinions as to the origin of this source of uncertainty, the author of this contribution from the Ohio Experiment Station proceeds to an account of an experimental study of such possible factors in the behavior of quinhydrone electrodes in soil-water mixtures as the relation of various comparison electrodes to the observed soil pH values, the effect of stirring on the constancy of the pH readings, the use of recrystallized quinhydrone, the effect of previous peptization of the soil with water, the material and form of the electrode, the manner of cleaning the electrode, etc. The results of a large number of measurements are given.

The fluctuations in soil pH values as measured against the saturated calomel half cell, 0.05 N potassium acid phthalate, and 0.01 N hydrochloric acid plus 0.09 N potassium chloride electrodes varied with the various soils, but the calomel half cell was given preference because of its stability. Significant differences among the results obtained with the platinum cone, platinum foil, platinum gauze, and gold foil metallic electrodes were not detected. "The platinum cone has the advantage of being more rigid and compact."

Mechanical stirring reduced the deviations in the observed pH values of the soils examined, the lower part of the soil suspensions tending to be more acid than the upper.

Recrystallizing the quinhydrone did not affect materially the changes in the observed pH value as compared with those noted when using a good commercial C. P. quinhydrone. Neither carbon dioxide-free air nor hydrogen passed through the soil suspension influenced the pH deviations, and leaving the soil-water mixture standing overnight did not reduce the observed fluctuations.

"A definite technique is necessary for obtaining satisfactory results with the quinhydrone electrode. The care of the metallic electrodes is of prime importance. A solution of definite pH or a control soil is used to check the accuracy of the electrodes. The first reading, made at least within one minute after the electrodes are immersed in the soil suspension, is the more nearly correct reading."

Some effects of fertilizers on the nature of the soil solution with special reference to phosphorus, C. H. Spurway (*Jour. Amer. Soc. Agron., 20 (1928), No. 8, pp. 802–807*).—Some data obtained in a study made at the Michigan Experiment Station, by means of a simple field test devised by the author of the present communication for the determination of the solubility of phosphatic fertilizers in soil (E. S. R., 56, p. 321), are here stated. The work was "primarily an attempt to determine just what can be accomplished in the field by means of a sensitive microchemical test . . . but the resulting data throw some light on the effects of fertilizers in modifying the concentration of the soil solution."

A rough correlation between the test results and the quantity of fertilizer used was observed, but it is noted that "test results obtained from the use of a microchemical test of this kind can not be correlated directly with crop response to fertilizers except over the range in which the element in question is limiting. If some other element or factor is the limiting one, then the test can not be used as an indicator of crop response."

It was found that in some instances the dry soil gave higher results for soluble phosphorus than did the wet, a result believed to be "due to changes in the colloidal system induced by the evaporation of water." It is further stated that "this phosphorus test has been criticized on the basis of not being sensitive enough to show minor variations in soluble phosphorus content, but an examination of the results presented will show that very little additional information can be obtained by a more sensitive field test, while greater sensitivity would increase the hazards of its use."

A rapid electrometric method for measuring "lime requirements" of soils, F. Hardy and A. H. Lewis (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 1*, *pp. 17–25*).—A rapid method based on "the development of 'exchange acidity,' by treating a known mass of the soil under examination with a solution of calcium chloride, and then titrating the mixture directly with dilute standard limewater until its pH value reaches 7.0, as determined by the quinhydrone electrode," is described, which appears to give more reliable results than the Hutchinson-MacLennan method (E. S. R., 33, p. 622). The method is carried out as follows:

"Ten gm. of soil are mixed in a small wide-mouthed bottle with 40 cc. of neutral 0.2 M $CaCl_2$ solution. The mixture is then titrated with 0.03 N limewater in successive portions of 5 cc., with three minutes' shaking between each addition. The pH value of the mixture is determined after each addition, and the titration continued until the reaction has passed pH 7.0. The results are plotted, and the exact volume of limewater needed to give a final reaction of pH 7.0 is estimated from the graph."

Liming as a factor in the amelioration of deteriorated tropical soils, P. E. Turner (*Jour. Agr. Sci.* [*England*], *19* (*1929*), *No. 1*, *pp. 83–89*).—Experiments on a Trinidad soil which had been under continuous culture in sugar cane and was decidedly acid and deficient in exchangeable calcium showed that this condition was effectively corrected by relatively large applications of finely ground limestone. "A significant increase in crop yield was obtained only on those plats which were later shown to have been rendered neutral in reaction by liming, and on which the degree of saturation of the top 6 in. of soil had been raised to 80 per cent."

Value of lime on Cecil clay loam soil, C. B. Williams, S. K. Jackson, and F. T. Meacham (*North Carolina Sta. Bul. 261* (*1928*), *pp. 26*).—In field experiments carried on from 1918 to 1926, lime without fertilizer gave the largest percentage increase in yields with all crops, but did not bring about as large increase in actual yields in the cases of corn, wheat, cotton, and red clover as did combinations of lime with certain fertilizers. The opinion is expressed that "the favorable effect of lime upon the yields of corn, wheat, and cotton was no doubt directly due to the larger amounts of clover available for turning under on plats receiving the applications."

Without clover in the rotation it is considered likely that the use of lime will rarely prove profitable for corn, wheat, or cotton growing. Despite a "remarkably large percentage increase" in red-clover yield as the result of applying lime alone, the actual yield of hay per acre is said to be "too small to justify its use in growing this crop under general farm conditions unless complete fertilizer high in available phosphoric acid and moderately high in potash is used."

It is further stated that "lime exerts its most favorable influence upon corn and wheat in the rotation when supplemented by moderate amounts of nitrogen in a complete fertilizer. When cotton follows a good stand of red clover in the rotation, the net returns from lime [are] not materially increased by nitrogen additions in the fertilizer. This should not be taken to indicate, however, that nitrogen fertilization would not be profitable if the cotton were grown later in the rotation. . . . The addition of phosphoric acid and potash has generally lessened the favorable response of crops to lime, indicating that where these are present in sufficient amounts applications of lime are less essential."

Value of lime on Norfolk sandy loam soil, C. B. Williams, H. B. Mann, and R. E. Currin, jr. (*North Carolina Sta. Bul. 262 (1928), pp. 21*).—In contrast to the results above noted with Cecil clay loam, it was found in field experiments carried on from 1918 to 1921 that the use of lime alone or in combination with fertilizers did not pay for itself on Norfolk sandy loam. "In many cases it actually reduced the average yields of [corn and cotton] as well as that of peanuts.

"The use of lime seemed to be most harmful to the yields of corn, cotton, and peanuts under the following fertilizer treatments: (1) With corn—when only two of the essential constituents of plant food were supplied, and when complete fertilizers high in nitrogen and potash were used; (2) with cotton—when only phosphoric acid and potash or nitrogen and potash were supplied, and when complete fertilizers, high in phosphoric acid or potash, and when high amounts of complete fertilizer were applied; and (3) with Spanish peanuts—when only phosphoric acid and nitrogen or nitrogen and potash were supplied, and when complete fertilizers high in phosphoric acid, nitrogen, and potash each were used."

The lime status of soil in relation to an insect pest of sugar-cane, P. E. Turner (*Jour. Agr. Sci. [England], 19 (1929), No. 1, pp. 26–35*).—A very close relationship was found to exist between froghopper (*Monecphora* (*Tomaspis*) *saccharina*) injury of sugar cane in Trinidad and the amount of exchangeable calcium in the soil. Soils on which the injury occurred were devoid of calcium carbonate and, as a rule, markedly acid, while those on which it did not occur almost invariably contained at least traces of this substance and in general were alkaline or only slightly acid. "There is evidence that in soils containing more than 7 mg. [exchangeable calcium] per cent, the effect of the soil deficiency in exchangeable calcium on the reaction of the cane to froghopper attack is mainly indirect, by reason of its influence on the physical condition of the soil. Where the soil content falls appreciably below this value, the data obtained indicate that calcium starvation of the cane may contribute to the damage it sustains."

The tolerance limit of seedlings for aluminum and iron and the antagonism of calcium, J. R. Skeen (*Soil Sci., 27 (1929), No. 1, pp. 69–80*).—Using the growth made and the condition of the radicals of *Lupinus albus* and *Phaseolus vulgaris nanus* as criteria, the author of this communication from the University of Pennsylvania compared the toxicity of the iron and aluminum ions in solution culture and pot experiments. He reached the conclusions that raising the temperature from normal to 29° C. increased the toxic effect both of iron and of aluminum ions upon both the species used as test plants; that the *Lupinus* sp. was about three times as resistant to aluminum as the *Phaseolus* sp.; that the iron ion "is about five to seven times as toxic as the H ion"; that there is support for the opinion that H-ion concentration is in itself "of little importance as an ecologic factor"; and that calcium shows a demonstrable antagonistic effect toward iron and aluminum toxicity.

The approximate tolerance limits of concentration of iron and of aluminum for the two species are estimated.

A preliminary note on the effect of sodium silicate in increasing the yield of barley, R. A. Fisher (*Jour. Agr. Sci. [England], 19 (1929), No. 1.*

pp. 132–139, fig. 1).—A statistical analysis of data from experiments at Rothamsted, in which the addition of sodium silicate has been found to increase the yield of barley to a considerable extent, appears to show that "the silicate acts by making available to the plant the actual reserves of soil phosphates."

Report on inspection of commercial fertilizers for 1928, E. M. Bailey (*Conecticut State Sta. Bul. 296* (*1928*), *pp. 95+X*).—This is the usual annual report of registrations, analyses, etc, with a statement of the State law.

Testing fertilizers, spring, 1928, L. D. Haigh (*Missouri Sta. Bul. 263* (*1928*), *pp. 12*).—Fertilizer analyses for 1928, as compared with the manufacturers' guaranties, are reported in the usual form.

Analyses of commercial fertilizers, fertilizer supplies, and home mixtures, 1928, C. S. Cathcart (*New Jersey Stas. Bul. 479* (*1928*), *pp. 39*).—This is the usual annual report of fertilizer analyses.

AGRICULTURAL BOTANY

Plant anatomy, H. Molisch (*Anatomie der Pflanze. Jena: Gustav Fischer, 1927, 3. ed., rev., pp. VIII+162, figs. 150*).—This volume outlines in compact form, primarily for the use of students, the elements of plant anatomy as introductory and basal for further study.

An electric method of determining the moisture content of living tissue, W. Robinson (*Ecology, 7* (*1926*), *No. 3, pp. 365–370, fig. 1*).—Credit is given to A. Zeleny[1] for the invention and description of an electrical apparatus which was used by the inventor for determining the moisture content of such commodities as corn, coal, and lumber, and which was employed by the present author in construction suitable for laboratory experimentation to ascertain moisture content in tissues of animals and even of growing plants. The apparatus, as described, was tested out on larvae, also on Tradescantia, Coleus, and Syringa, and the results are tabulated. Adaptations as outlined indicate the range of applicability.

A stable colorimetric standard for chlorophyll determinations, J. D. Guthrie (*Amer. Jour. Bot., 15* (*1928*), *No. 1, pp. 86, 87*).—It is claimed that the colorimetric standard here described as stable and easily duplicable is not impaired by the disadvantages which are claimed to be inherent in the standard commonly employed as obtained from the saponification of the pigment itself.

The method for which this standard was devised is essentially that used by Willstätter and Stoll (E. S. R., 30, p. 311). Suggestions and directions are briefly detailed.

Methods of collecting and preserving pollen for use in the treatment of hay fever, J. W. Kelly (*U. S. Dept. Agr. Circ. 46* (*1928*), *pp. 10, figs. 7*).—Discussing pollen collection in general, the author outlines a method of collecting in which the entire plant is harvested at the blooming stage and allowed to shed pollen while standing in a tank so designed that the flowering heads hang over the edge, allowing the pollen to fall on paper or cloth. Data are given on the yield of pollen from timothy and ragweed and on the best time of gathering from various species.

Light intensities required for growth of coniferous seedlings, C. G. Bates and J. Roeser, jr. (*Amer. Jour. Bot., 15* (*1928*), *No. 3, pp. 185–194, fig. 1*).—Earlier experimentation (E. S. R., 56, p. 627) tested the existence and extent of differences between species as regards tolerance of shade or ability to grow in the weak light sometimes found under the forest canopy. The present series of experiments centers about a few conifers which have been studied from different angles.

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[1] Minn. Engin., 17 (1909), No. 3, pp. 163–170, figs. 5.

Evidently wide variations must exist in the ability of the different species to use weak light of the quality furnished in this experiment. Redwood, growing on a minimum requirement of less than 0.75 per cent and increasing its original size almost 10 times in light of 10 per cent intensity, stands out as by far the most efficient mechanism for photosynthesis. Engelmann spruce and the two forms of Douglas fir stand out together and not far behind redwood, though they require perhaps twice as much light for appreciable growth. The pines as a group require 3 or 4 times as much light as does redwood, while piñon stands apart with a light intensity requirement of 5 per cent or more.

"There is sufficient difference in growth responses under the conditions of this experiment, if not in absolute light requirements, to show plainly the extent to which geographic forms or varieties of the same species develop individual physiological characters. The growth curves for Colorado and Arizona yellow pine are quite similar, as might be expected, while the Coast form of Douglas fir, though more active and responsive on the whole than the Colorado form, is relatively much less responsive to very weak light. There may be a temperature response involved in this difference.

"The extent to which a few individuals of several of the species, presumably those of greatest initial size and vigor, stand out above the mass in photosynthetic efficiency or at least in survival in weak light, suggests the possibility of utilizing conditions such as obtained in this experiment for the artificial selection of a strain possessing high efficiency." It is emphasized that actual failure to synthesize and produce growth is not so likely to be fatal to seedlings as the fact that slow growth, particularly insufficient food for the roots, fails to prepare the seedling to withstand the surface drying of the soil, which is more or less normal toward the close of any growing season.

Studies of the photoperiodism of some economic plants, T. B. McClelland (*Jour. Agr. Research [U. S.], 37 (1928), No. 10, pp. 603–628, figs. 12*).—In continuation of studies on the photoperiodism of plants in Porto Rico, where the range of length of day is from 11 to 13.2 hours (E. S. R., 52, p. 126; 54, p. 625), the author reports additional investigations on the photoperiodism of sweet potatoes, onions, pineapples, potatoes, corn, and beans, the daily light period being extended in the experiments to 15 hours by the use of electric light.

An 11-hour daily light exposure proved to be more favorable to the blossoming of sweet potatoes than a 13.5-hour exposure. The growth of different varieties of onions under the varied light exposures showed considerable sensitiveness to the duration of the daylight period. Certain varieties which form large bulbs in temperate latitudes failed to form bulbs when grown in the Tropics. Lookout Mountain potatoes were more sensitive, and Red Bliss less so, to the differences in length of day than Irish Cobbler. With Porto Rican corn, lengthening the daily exposure of light delayed blossoming and a greater height of stalk was attained, but the production in number and size of ears was less than under normal light exposures. With pineapples, under the longer exposures blossoming was delayed, the size of the fruit was considerably larger, and the production of slips and the total growth were increased. Vegetative activity, as shown by the greater height and a prolonged period of growth, was evident for beans under longer light exposure.

The change of opposite to alternate phyllotaxy and repeated rejuvenations in hemp by means of changed photoperiodicity, J. H. Schaffner (*Ecology, 7 (1926), No. 3, pp. 315–325, fig. 1*).—It is stated that although the change in hemp from opposite to alternate phyllotaxy is usually a regular occurrence toward the end of the sporophyte ontogeny, this change can be induced at a much earlier stage by environmental control. If hemp plants are developed in the short light period of winter and thus brought to an early maturity and then rejuvenated by means of continuous light, either from the tip or from lateral buds, the plants will pass immediately from the opposite to the alternate phyllotaxy. This change can be induced after the fourth leaf node. If hemp plants are brought to the blooming period with the short light period of late winter and are then exposed to continuous illumination, they will all rejuvenate from the terminal bud, both staminate and carpellate, and continue their growth with alternate phyllotaxy. If the plants come to the blooming stage in the early spring when the days are lengthening decidedly, some will rejuvenate naturally, usually from lateral buds below the inflorescence. Hemp plants grown in continuous light (daylight and electric light) will change their phyllotaxy at an early stage from opposite to alternate but without apparent change in leaf character, and the shorter the natural daylight is at the time the earlier, usually, will the change occur. Sporadically opposite leaf nodes occur along with the alternate nodes, and occasionally the alternate phyllotaxy will recur completely to the opposite, but this change is not induced experimentally.

In rejuvenation through the use of continuous light, whenever regrowth originates in a rather extreme, senile condition the new leaves tend to have completely entire margins or to be toothed only on the outer end, and also they change to the simple or unifoliate type, either at once or after the production of one or more trifoliate leaves. If maturity (or senility) is not far advanced the new leaves do not develop entire margins, and may not go beyond the threefoliate stage in simplicity. After rejuvenation there occurs a succession of leaf forms corresponding to the succession of forms developed by the juvenile plant from the seed. Repeated rejuvenations can be produced in staminate and carpellate plants. Three actual rejuvenations have been produced in individuals, with four periods of vegetative development and four periods of blooming. Rejuvenated staminate hemp plants have been kept alive for more than a year, though these plants naturally die about the time they are 15 weeks old in the latitude of Columbus, Ohio.

Further experiments in repeated rejuvenations in hemp and their bearing on the general problem of sex, J. H. SCHAFFNER (*Amer. Jour. Bot., 15 (1928), No. 1, pp. 77–85, fig. 1*).—In pursuance of the work above noted, practical results have been obtained which indicate that a study of repeated rejuvenation in plants can be used in various ways in the solution of both practical and theoretical problems. Hemp was planted November 26, 1924, in a tank about 3 ft. wide and with soil about 3 ft. deep. The management of the plants is outlined.

Carpellate hemp plants were, by means of continuous illumination, rejuvenated 3 times, thus going through 4 ontogenetic or expression cycles. At each rejuvenation the cycle of differentiation begins at the same level, the simple entire leaf. Normally the rejuvenated shoots have an alternate phyllotaxy. The most vigorous plants lived 88 weeks, or about 4 times as long as did carpellate plants raised out of doors.

Fumigation by tobacco smoke is more injurious to rejuvenating staminate plants than to rejuvenating carpellate plants. Plants fumigated during the original blooming period appeared different as regards resistance, although all were greatly injured by the tobacco fumes.

The very old, repeatedly rejuvenated plants are especially susceptible to the attack of mealybugs, scale insects, and other forms, though neighboring first-differentiation-cycle plants show almost complete immunity. Rejuvenation was successfully used to induce branching with subsequent increase of seed production on winter-grown hemp, in hybridization experiments.

The fact that sex reversal can be successfully produced during the second ontogenetic differentiation cycle of rejuvenated plants in individuals that were of pure sex expression in the first or natural differentiation cycle indicates that speculations as to the nature and fixity of sex, especially in relation to heredity, are questionable as to value, and that formulas based arbitrarily on the behavior of individuals during their first differentiation cycle are not to be accepted as an explanation of the real nature of such individuals. It is held that if these individuals had been subjected to a different environment during their first life, a different functional gradient could have been established, with a consequently different character expression in respect to sex.

Röntgen rays and stimulation of cell function [trans. title], F. M. GROEDEL and E. SCHNEIDER (*Zellstimulationsforsch., 2 (1927), No. 4, pp. 371–380, figs. 2*).—Researches have up to the present time shown, in general, with small doses of Röntgen rays a cell-stimulating, with large applications a cell-killing effect.

Influence of radioactivity on the formation of new living plant masses [trans. title], J. STOKLASA (*Zellstimulationsforsch., 2 (1927), No. 4, pp. 347–370, figs. 5*).—Specific data and general statements are presented in support of the author's claims that growth of desirable plant structures and resistance to parasitic attack are increased as a result of irradiation with various emanations indicated.

Growth and germination of sunflowers as influenced by X-rays, E. L. JOHNSON (*Amer. Jour. Bot., 15 (1928), No. 1, pp. 65–76, figs. 7*).—In experimentation in which numerous plants of *Helianthus annuus* were grown to maturity, it was found that irradiation of sunflower seeds by X-rays does not increase germination rate, germination percentage, growth during early seedling stages, height at maturity, or final weight. In seeds irradiated during germination and growth with medium dosage of X-rays (5–10 *E*) an inhibitory effect shows during the first few weeks. After about three weeks, the plants grow rapidly until maturity, showing very little difference from the controls as regards total height or time of blooming. Seeds when air-dried are much less susceptible to harmful X-ray effects than are those which have 50 per cent or more of water. Seeds of the same species show differences as regards injury due to equal dosage under identical conditions.

Plant distribution as affected by the hydrogen ion concentration of the soil, F. G. GUSTAFSON (*Mich. Acad. Sci., Arts, and Letters, Papers, 6 (1926), pp. 237–246*).—Evidence is offered regarding the view that plant distribution depends largely upon the active acidity concentration of the soil, and ways are suggested in which H-ions may affect plant growth.

Measurement of environmental factors in the tropical rain-forest of Panama, W. C. ALLEE (*Ecology, 7 (1926), No. 3, pp. 273–302, figs. 9*).—It is stated that more than half the country of Panama is covered by such rain forests, dominated by mesophytic cotyledons, as that on Barro Colorado Island in Gatun Lake in the Canal Zone on the Isthmus of Panama, where most of these measurements were made during January to March, 1924, though for purposes of comparison light readings were taken on other parts of the Canal Zone and in different regions of temperate North America.

Though the Canal Zone is said to be divisible into two climatic regions, only slight change in barometric pressure occurs within the zone throughout the year. In the rain forest, there is practically no horizontal air movement near the forest floor, though a marked gradient occurs between the floor and the canopy, and a still more marked one from the forest roof to the free-moving air overhead. A comparable gradient of temperature change persists. Evaporation at the forest floor is about half that in the roof, which is one-third that over the neighboring lake. Illumination at the forest floor shows relatively little variation, even between day and night. The average light intensity during the dry season in the forest canopy is 25 times, and above the forest roof 442 times, that in the shade on the ground, and comparable differences exist between the denser forest and the large flecks of sunshine or open, unshaded situations.

Boron in the soils and irrigation waters of southern California and its relation to citrus and walnut culture, W. P. Kelley and S. M. Brown (*Hilgardia* [*California Sta.*], *3* (*1928*), *No. 16, pp. 445–458*).—Attention of the authors was called in 1925 to injuries to citrus trees growing in the vicinity of citrus packing houses where borax was used as a fungicide in the wash waters and later became a contamination of the irrigation supplies. Laboratory and field studies are reported on the nature of the injury, sources of boron, its absorption and accumulation in citrus and walnut trees, etc.

The authors report that concentrations of boron occur in certain irrigation waters of southern California that are toxic to citrus and walnut trees, and in a few relatively small areas the soil contains an injurious quantity of soluble boron. Citrus trees are said to show the toxic effect of boron by a yellowing of the older leaves about the margins and between the veins and a dying back of the tips and margins. Many of the affected leaves fall off in the winter and early spring months. The new growth may not show the injury until it is several months old. When walnut trees are injured by boron, the leaves are said to turn brown around the margins and between the veins during August and September, and the leaves fall prematurely. Earlier in the year the leaves may not show any evidence of boron injury.

Citrus and walnut trees were found to absorb boron readily, and this element accumulated in the leaves. The authors believe that the determination of the boron content of the leaves of citrus and walnut trees offers valuable indications as to whether this element is the cause of abnormal leaf conditions.

When introduced into the soil as a constituent of the irrigation water, boron was found to accumulate gradually in the upper layers of the soil as a result of evaporation. Heavy rains are believed to carry down some of the boron and thus retard its accumulation in the region of tree roots.

Mycorhizas from North Carolina and eastern Tennessee, W. B. McDougall (*Amer. Jour. Bot.*, *15* (*1928*), *No. 2, pp. 141–148, figs. 3*).—"The data presented in this paper support the hypothesis that in the ectotrophic mycorrhizas of forest trees the symbiotic relationship between the fungus and the higher plant is antagonistic and not reciprocal; that is, that the fungus is a parasite on the root and derives food from it but that the root receives no benefit and may be injured by the relationship."

GENETICS

Trinidad Cotton Research Station, genetics department, S. C. Harland (*Trop. Agr.* [*Trinidad*], *5* (*1928*), *No. 12, pp. 303–305, pls. 4*).—Genetic investigations with cotton summarized briefly were concerned with cytological and hereditary differences among New World and Asiatic cottons, linkages between significant factors, new hybrids, abnormal types, and breeding technique.

Seed-coat structure and inheritance of seed color in sorghums, A. F. Swanson (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 10, pp. 577–588, fig. 1*).—A genetic study of crosses between Red Amber and Freed sorgos and Standard feterita and their reciprocals is presented, with an interpretation based on the microscopic characteristics of the seed coats of the segregates and of several standard sorghum varieties. The thickness of the various seed coat structures, pigment location, superficial seed color, and possible color factorial composition are tabulated for 18 representative sorghums.

In analyzing the relation of the seed coat structures to the genetic factors controlling inheritance, *B* was assumed to be a factor which when present is responsible for the development of the nucellar layer and associated pigment, while *b* determines their absence. There was evidence that *B* may cause slight coloration in the pericarp epidermis when in combination with the factor *S*. *S* determines the development of a vestigial type of mesocarp, while *s* produces a well developed, starchy, opaque mesocarp which when about 70 μ thick masks nucellar color and inhibits even a slight expression of pericarp color due to *B*. *R*, which determines coloration in the epidermal and hypodermal cells of the pericarp, is greatly intensified in the presence of *B* and *S*. Slight pericarp coloration due to *B* seems independent from *R* in inheritance, their interaction producing more intensive color in the presence of *S*.

The mesocarp ranges in thickness from 0 in certain sorgo hybrids to 70 μ or more in feterita. Although the thickness of mesocarp in a sorghum variety seems to be a fairly constant heritable character, environmental factors may alter its development and also affect pericarp pigmentation.

The nucellar layer, a remnant of the nucellus not absorbed during development of the embryo and endosperm, is entirely absorbed in some sorghum varieties. It did not exceed one cell in thickness in any variety studied, and in Pink kafir only a thin remnant of its outside wall was found. A group of scattered nucellar cells overlaid by a thin mesocarp seemed responsible for the specks in the seed coat of certain white-seeded kafirs. There appeared to be no endosperm or aleurone colors in sorghums such as occur in corn.

Wheat albinos, W. K. SMITH and J. B. HARRINGTON (*Jour. Heredity, 20* (*1929*), *No. 1, pp. 19–22, fig. 1*).—About one sixty-fourth of the seedlings in F_2 of Vernal emmer (*Triticum dicoccum*) × Marquis wheat (*T. vulgare*) grown at the University of Saskatchewan were albinos, which grew normally for a few days but died when the nutrients in the endosperm were exhausted. In F_3 some progenies consisted only of green seedlings, while others were composed of green and white seedlings about in 3:1, 15:1, and 63:1 ratios. Vernal and Marquis seemed to carry three recessive genes for albinism, two of them being in one variety and the third in the other. The appearance of white seedlings in Mendelian ratios in the cross, Vernal × Marquis is held to be evidence that some *T. dicoccum* chromosomes mate regularly with *T. vulgare* chromosomes.

Chromosome numbers in Zea mays L., L. F. RANDOLPH (*New York Cornell Sta. Mem. 117* (*1928*), *pp. 44, pls. 3*).—Cytological studies in 338 plants pertaining to commercial varieties of dent, flint, sweet, and pop corn and to a number of genetical cultures showed that in 200 plants the diploid chromosome number was 20, while in the others the numbers ranged from 21 to 28. Plants with more than the typical number of chromosomes were found in Black Mexican and Golden Bantam sweet corn, New York State Flint and Hall Golden Nugget (flint), and in seven genetical cultures. A pronounced variation in the chromosome number in different plants was characteristic of the exceptional cultures. Variations in chromosome number were noted in the progeny of plants self-pollinated for several generations. The chromosome number was found to be constant in different root-tip cells, and generally in different microsporocytes of individual plants. Of 31 plants examined 29 had the same meiotic and somatic numbers, and in 2 plants the somatic numbers exceeded the meiotic numbers.

Chromosomes of the typical complement regularly formed 10 bivalents in diakinesis and behaved normally subsequently in meiosis. While the bivalent chromosomes differed in length, significant differences were not observed in the lengths of the members of individual bivalents. In plants with extra chromosomes, 20 chromosomes present appeared to resemble in form those of the typical complement, and there were additional units distinguishable during microsporogenesis by their form and staining reaction. In the root-tip cells of 20-chromosome plants the shortest chromosomes were about 2 μ long and the longest about 4.5 μ long, a similar range of variation being noted in the extra-chromosome plants. Plants with higher numbers had more short chromosomes than did plants with the typical number, whereas the number of long chromosomes appeared similar in all plants examined. The possible rôle of segmentation, fusion, duplication, and hybridization is discussed in relation to the origin of the extra chromosomes.

Cytological studies in the genus Ribes L., O. MEURMAN (*Hereditas, 11 (1928), No. 2–3, pp. 289–356, figs. 133*).—Studies with 22 Ribes species and hybrids showed the haploid number of chromosomes to be 8. Differences were recorded in the size of chromosomes, not only between species but also within a species. One chromosome pair with a relatively large satellite was observed as a constant feature.

Growth hormones [trans. title], H. SÖDING (*Zellstimulationsforsch., 2 (1927), No. 4, pp. 381–392, figs. 4*).—Though but little is yet known regarding growth hormones, and almost all the data at hand still require completion and confirmation, it is regarded as already apparent that here is a long neglected region of great significance as regards the physiology of growth. It is thought that without amplified knowledge of growth hormones the thoroughgoing solution of many stimulational-physiological problems will not be possible.

The estimation of linkage from the offspring of selfed heterozygotes, R. A. FISHER and B. BALMUKAND (*Jour. Genetics, 20 (1928), No. 1, pp. 79–92, figs. 2*).—The author compares five methods of estimating linkage in an F_2 population, designated as the sum of complementary classes, weighted mean, product ratio, maximum likelihood, and minimum χ^2 methods, showing the advantage and errors of each method. The method of maximum likelihood may be applied directly and is directly related to the χ^2 measure of discrepancy.

Amputated, a recessive lethal in cattle, with a discussion on the bearing of lethal factors on the principles of live stock breeding, C. WRIEDT and O. L. MOHR (*Jour. Genetics, 20 (1928), No. 2, pp. 187–215, figs. 3*).—The inheritance of an abnormality designated as amputated and occurring in Holstein-Friesian cattle is described, in which the affected individuals have a deformed head with the fore legs ending at the articulatio cubiti and the hind legs ending at the hock, with numerous other anatomical malformations. Data are presented to indicate that this condition is due to a simple recessive autosomal gene. In 115 matings of heterozygous bulls back to their daughters there were 102 normal calves and 13 amputated calves, which is close to the expected 7 : 1 ratio.

The authors point out how undesirable recessives, when carried by the foundation sires of the breed, may be distributed throughout the breed.

Attention is called to the occurrence and spreading of lethal and sublethal recessives in fowls, lambs, horses, and cattle, with reference to their presence in prominent herds and the economic importance of lethals. Testing sires by daughter matings is suggested as a means of detecting carriers of recessive lethals.

An eight-factor cross in the guinea pig, S. WRIGHT (*Genetics, 13 (1928), No. 6, pp. 508–531*).—Stocks of guinea pigs carrying 8 dominant and 8 recessive factors, respectively, in the series designated as S, E, A, C, B, P, R, and M were crossed for a study of the linkage relations and the random assortment of the classes expected in the back-cross. No autosomal or sex linkage of the XY or

ZW types were indicated. Among the 398 young produced, 143 of the 168 visibly distinct combinations expected in the back-cross generation were obtained, and the distribution was considered as random.

Other observations indicated no tendency for litter mates to resemble each other more closely than would be expected by chance. Two possible cases of uniovular twins were found where three cases of resemblance in all noninterfering respects were expected by chance.

The agouti coloration of the mouse (Mus musculus) and the rat (Mus norvegicus), F. W. Dry (*Jour. Genetics, 20 (1928), No. 1, pp. 131–144, fig. 1*).—From a histological study of agouti hair in rats and mice, the author has noted a correlation between the presence and size of the agouti band with hair type and size, and an orderly relation in the type, size, and color of successive products of the same follicle. It is suggested as a working hypothesis that any hair is potentially black or yellow, but that from different degrees of activity of the hair-producing tissue different colors result.

The greater stability of enzyme *B*, which produces black, and the enzyme *I*, which inhibits black, enables the transition of low-rate black to be passed with sustained full black pigmentation. Black pigment is formed under two different sets of conditions, while yellow pigment is produced in intermediate conditions.

Further notes on Dutch and English rabbits, R. C. Punnett (*Jour. Genetics, 20 (1928), No. 2, pp. 247–260, figs. 6*).—In continuing the discussion of the genetical interpretation of the Dutch and English patterns (E. S. R., 55, p. 524), including Castle's paper (E. S. R., 57, p. 323), the author gives further evidence in support of the one major factor and three minor factors as the basis for the Dutch pattern. In English×Dutch crosses there was evidence of linkage between the grade of Dutch and the factor tortoise.

Experiments on the inheritance of weight in rabbits, M. S. Pease (*Jour. Genetics, 20 (1928), No. 2, pp. 261–309, figs. 24*).—In a study of the inheritance of weight in a Polish-Flemish cross, the complete range of weights was obtained in 309 F_2 animals, thus supporting the multifactor explanation of the inheritance of weight.

The mean weight of the F_1 generation was about midway between the parent stocks, but closer to the smaller Polish type. The variability in the F_1 weights was but 6.3 per cent as compared with 10 per cent in both parent breeds.

The numbers were insufficient to indicate whether there was a single predominating weight factor, though there was some indication of discontinuous distribution in the offspring of particular matings, and some light-weight F_2 animals bred true in the F_3 generation. No heavy animals, however, produced uniformly heavy offspring. By arranging the weight frequency curves on a logarithmic scale it was at once evident that weight factors act in a logarithmic manner.

From the F_2 population it was possible to select strains differing in the rate of maturity, one strain maturing at an average age of 172 days and another at 300 days. These families appeared to breed true. Rate of maturity was not appreciably affected by the season of the year in which the rabbits were born or in which they reached maturity, nor was it affected by sex or litter size. There was a considerable negative correlation between weight and rate of maturity, though this association was conspicuously absent in many individuals.

Inheritance of structural types in the dorsosacrum of domestic poultry, A. N. Promptoff (*Jour. Genetics, 20 (1928), No. 1, pp. 29–51, figs. 4*).—Anatomical study of the dorsosacrum of approximately 4,000 fowls used in breeding studies at the Anikovo Genetical Station, Moscow, indicated that about 75 per cent have four dorsosacral vertebrae, while the balance have three or five vertebrae in this region. The inheritance of these conditions is suggested as depending upon three pairs of factors, i. e., *A*, producing the normal number of dorsosacral vertebrae, its recessive *a* also tending to produce the normal number in the absence of *B* and *C*; *B*, hypostatic to *A*, but epistatic to *a*, tending to produce five dorsosacral vertebrae; and *C*, incompletely epistatic to *A* and *B*, tending to produce three dorsosacral vertebrae.

Variations in the regularity of these three types, with special reference to the vertebrae processes, are suggested as being due to the interaction of the three pairs of factors.

Inheritance of earlobe color in poultry, D. C. WARREN (*Genetics, 13* (*1928*), *No. 6, pp. 470–487, figs. 2*).—In a study of the inheritance of ear-lobe color in poultry at the Kansas Experiment Station in crosses between white ear-lobe breeds, i. e., Single Comb White Leghorns, Rose Comb Brown Leghorn, and Single Comb Buff Leghorn, and red ear-lobe breeds, i e., Jersey Black Giant, Barred Plymouth Rock, Single Comb Rhode Island Red, Dark Brahma, White Wyandotte, and Silver Laced Wyandotte, the F_1s from practically all of the crosses were found to have ear lobes varying from entirely red to entirely white. Complete dominance was not obtained. The offspring of the F_1 birds tended to vary in ear-lobe color in the same direction as their parents.

From a study of the distribution of ear-lobe color in the offspring of reciprocal crosses, it was concluded that sex-linked factors were operative as well as autosomal factors, but the sex-linked factors were effective only when homozygous. Some of the breeds did not possess the sex-linked genes, or at least their effect was not apparent in the crosses. The major factors for ear-lobe color appeared to be autosomal. Linkage relations in the sex chromosome indicated that the factor for ear-lobe color was located nearer the sex-linked factor for shank color than it was to the sex-linked factor for rate of feathering. The autosomal factors for ear-lobe color were not linked with dominant white, rose comb, or egg color.

Individuals within breeds were evidently not homozygous for the ear-lobe factors. Rhode Island Reds evidently did not carry the sex-linked factor. There were at least two autosomal factors for ear-lobe color in addition to the sex-linked factor operating in the Single Comb White Leghorn and Jersey Black Giant crosses.

A case of lateral asymmetry in the domestic fowl, F. A. E. CREW (*Jour. Genetics, 20* (*1928*), *No. 2, pp. 179–186, pl. 1*).—A fowl with the left side of the body and left leg larger than the corresponding right members, with the left leg white and the right leg yellow in color, and with red pigment in the white plumage, is described. Although it was suggested as a sexual gynandromorph, final analysis indicated that such was not the case. It appeared and behaved as a male, and both tests revealed similar chromosomes. It was assumed that an autosomal chromosome carrying white was eliminated during the early cleavage divisions of a male zygote heterozygous for the characters white and yellow epidermal pigmentation.

The development of the spermatozoon in Cavia cobaya, M. T. HARMAN and F. P. ROOT (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 55* (*1928*), *No. 4, pp. 235–254, pls. 4*).—In continuing the study of the development of the spermatozoa in the guinea pig (E. S. R., 55, p. 819), the authors describe the changes after the completion of the last maturation division with special reference to an abortive effort on the part of the spermatid to divide and lack of evidence of loss of cytoplasm or sloughing as described by others, though prior to elongation there appeared to be a shrinking of the cytoplasm and nucleus.

The elongation occurred in the nucleus and cytoplasm, and there gradually became evident the nucleus, acrosomes, and mid piece containing the spiral filament, and the tail, which was composed of three segments separated by definite nodes. There was no stage in which a filament extended out from the cytoplasm.

On the properties of the gonads as controllers of somatic and physical characteristics.—XI, Hormone production in the normal testes, cryptorchid testes, and non-living testis grafts as indicated by the spermatozoön motility test, C. R. MOORE (*Biol. Bul. Mar. Biol. Lab., Woods Hole 55 (1928), No. 5, pp. 339–357, figs. 2*).—The author points out that in the guinea pig the spermatozoa remaining in the inferior portion of the epididymis show motility for approximately 23 days after removal of both testes, but that when one testicle remains the duration of motility of the sperms is increased to about 65 to 70 days.

When one testis was removed along with the head and body of the epididymis and the inferior portion of the epididymis was allowed to remain in the scrotum, the length of time over which the sperms contained therein was motile was increased beyond 23 days by a time approximately equal to the time during which the other testicle was allowed to remain after the operation. When the removal of the second testis was delayed 40 days, however, the excess life of the sperm was little over 30 days because of the close approach to their maximum duration of life.

When the remaining testicle was retained in the abdomen, the spermatozoa retained in the inferior part of the epididymis maintained motility as long as though a normal testicle were present. This indicates that the spermatogenetic activity of the testicle is not located in the germinal tissue, since such is completely destroyed in cryptorchid testes. Thus the cryptorchid testis which was approximately 2.8 to 3.5 per cent of the mass of the normal testicle functioned as well as both normal testes. The Leydig cells are suggested as the source of the internal secretions of the testicle, although the general connective tissue and Sertoli cells are not positively eliminated as the source of this hormone.

In other experiments autoplastic subcutaneous transplants of testes furnished such small amounts of the hormone, if any, that the spermatozoa did not certainly live longer than in cases where both testes were removed without subsequent transplantation.

The duration of pregnancy in guinea-pigs after removal and also after transplantation of the ovaries, E. H. HERRICK (*Anat. Rec., 39 (1928), No. 2, pp. 193–200*).—Of 19 pregnant guinea pigs from which both ovaries were removed at different stages in the gestation period, 3 females from which the ovaries were removed at the twenty-seventh, fortieth, and fifty-eighth day of gestation produced normal live young. Another produced living young which were weak, while the others aborted at from 1 to 23 days after the operation. The results indicated that the functioning of the mammary glands and relaxation of the pelvic girdle were not dependent on the secretions of the corpora lutea or ovaries.

Ovaries from other females, mostly virgin, were implanted in 14 pregnant females at the time of removing their own ovaries. Of these, 5 aborted and 9 produced living young.

Effect of ovarian injury on egg laying in fowls, M. STEGGERDA (*Jour. Expt. Zool., 51 (1928), No. 3, pp. 403–416*).—In experiments at the Illinois Experiment Station, groups of fowls were selected and their ovaries mutilated or portions removed. Such treatment was found to have no apparent effect on the total egg production, weight, mortality, and fertility of such birds, though the variability in egg laying was greater than in control birds which were not so treated, and some operated birds began laying earlier than controls. The amount of ovarian tissue removed was not related to egg production within limits.

A sex difference in chromosome lengths in the Mammalia, H. M. Evans and O. Swezy (*Genetics, 13 (1928), No. 6, pp. 532–543, figs. 2*).—Comparison at the University of California of the lengths of the chromosomes from male and female human embryos, a labial carcinoma in man, and the endometrium of the early post menstrum in a woman, and in male and female rat embryos indicated that the larger chromosomes of the male nuclei were longer on the average than those from female cells. The sex difference in length was reduced, when the shorter chromosomes were considered, to the point where the shorter chromosomes of the female were longer than the corresponding pair in the males. In both man and the rat the length of the chromosome in the male showed greater variability than the length of the chromosomes of females. Thus the autosomes of the two sexes differ in character in both embryonic and adult tissue.

A study of the sex-linked cross between a White Bresse male and White Leghorn females (*Harper Adams Util. Poultry Jour., (1927–28), No. 9, p. 414*).—The use of shank color for the identification of the sex of chicks at hatching was found by the National Institute of Poultry Husbandry to be unsatisfactory in this cross. The color and other characteristics of the crossbreds are described.

A new sex-ratio abnormality in Drosophila obscura, S. Gershenson (*Genetics, 13 (1928), No. 6, pp. 488–507, figs. 4*).—From studies at the Institute of Experimental Biology at Moscow, the author describes the influence of a sex-linked gene which causes the offspring of males carrying it to be about 96 per cent females and only 4 per cent males. Its action is to remove almost totally the Y-bearing spermatozoa from the fertilization process, thus behaving like a male gametic lethal.

Sex ratio in Gambusia, S. F. Hildebrand (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 53 (1927), No. 5, pp. 390–404*).—It was found that in the immature Gambusia the sexes were equal but there was a large seasonal variation in the sex ratio of adults, varying from 1 male to 2.5 females in June to 1 male to 11.3 females in August. Explanations for the greater mortality of males are suggested. It was further shown that the seasonal variation in the ratios of males to females corresponded with the need for males for breeding purposes, and the thinning out of the males is suggested as nature's process of eliminating surplus animals.

The sex ratio in Peromyscus, J. J. Karol (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 55 (1928), No. 3, pp. 151–162, figs. 3*).—Data on the sex ratio among 2,522 deer mice born from 1922 to 1926 and 7,547 young born from 1915 to 1926 are given. There were 114.03±3.19 males per 100 females in the former group and 103.01±1.64 males per 100 females in the combined data. Seasonal fluctuation in the sex ratio was evident, but it was not in entire agreement in the two bodies of data. In the 1922–1926 data there was a high sex ratio in August and September, 143.68±13.50 and 140.35±19.42, followed by a low ratio in October and November, 92.96±10.67 and 76.67±10.15 males per 100 females. In the combined data there were maxima in April and August, but the author concluded that the existence of a seasonal cycle was not definitely proved. Yearly fluctuations in the sex ratios were apparent, but they were not statistically significant.

There was some fluctuation in the sex ratio within the different sized litters, although no definite relation appeared to exist. The distribution of the sexes of individuals within litters appeared to be a matter of chance. Though F_1 hybrids between species of Peromyscus showed higher sex ratios than were observed within species, the differences were not statistically significant.

Studies of human twins, I, II, H. H. Newman (*Biol. Bul. Mar. Biol. Lab., Woods Hole, 55 (1928), No. 4, pp. 283–297, 298–315*).—The first of these two papers deals with methods of diagnosing monozygotic and dizygotic twins. From efforts to differentiate accurately monozygotic from dizygotic twins of the same sex, criteria were set up to which monozygotic twins must conform. These were based on general appearance; hair, eye, and skin color and characteristics; arrangement of teeth, and characteristics of the hands, ears, etc.; finger and palm prints; and handedness and hair whorls. In 102 pairs of like-sexed twins only 6 pairs caused any difficulty in classification. It was concluded that only about 25 per cent of all twins and 42 per cent of the same-sexed twins are monozygotic.

In the second paper, Asymmetry Reversal of Mirror Imaging in Identical Twins, there was found to be very little evidence of asymmetry reversal among the most similar monozygotic twins, while there was a high degree of such reversal in the less similar monozygotic twins. This is explained as due to the fact that the epigenetic establishment of asymmetry takes place sometimes before and sometimes after twinning.

FIELD CROPS

Productive farm crops, E. G. Montgomery (*Philadelphia and London: J. B. Lippincott Co., 1928, 4. ed., rev., pp. XXXVIII+519, pls. [17], figs. [198]*).—A further revision of the book noted (E. S. R., 49, p. 31), including job analyses of different farming enterprises.

Use of water by cultivated plants in the field, N. Tulaikov (*Jour. Agr. Sci. [England], 19 (1929), No. 1, pp. 1–16*).—Water requirement studies with a number of field crops at the several experimental stations in the region of Saratov gave indications that the total quantity of water used in any year by different plants during growth in various parts of the region and on several soils was more or less uniform. It depended largely on the precipitation during the growth period and was therefore larger in moist years. In dry years the larger portion of the plant's total water requirement was obtained from the water stored in the soil and vice versa. Plants with a long period of growth got the largest portion of their water needs from rainfall during growth.

The transpiration coefficients of different plants in the same year differed noticeably and were considerably higher in a dry year than in a moist year. They were likewise much higher for early crops and beans and lower for winter rye and wheat, corn, sorghum, Sudan grass, millet, and potatoes, i. e., lower for the plants with a long period of growth. Spring wheat was the most exacting of all plants observed during the three years, and it had most often the highest transpiration coefficient. The lowest transpiration coefficients were noted more frequently in corn and winter rye.

Experimental pot cultures and their technique [trans. title], C. Brioux (*Ann. Sci. Agron. Franç. et Étrang., 45 (1928), No. 3, pp. 226–236, pls. 2*).—The rôle of pot cultures in agronomic experimentation is described from experiences of a number of investigators, comment being made on choice and manipulation of pots, protection of plants, organization of the work, and filling, fertilizing, seeding, and harvesting the pots.

Field work of the Ohio Agricultural Experiment Station, Wooster, Ohio (*Ohio Sta. [Pamphlet], [1928], pp. 35, pl. 1, figs. 3*).—Similar in scope to an earlier publication (E. S. R., 55, p. 528), this pamphlet presents the tabulated results of variety and cultural (including planting) tests with wheat, oats, corn, and soy beans, trials of barley, alfalfa, and red clover varieties and crop combinations, and cutting tests with sweet clover. The responses of different crops to fertilizers, lime, manure, and crop rotations are also summarized for different periods of years.

[Reports of the Dominion cerealist for 1926 and 1927], L. H. NEWMAN (*Canada Expt. Farms, Cereal Div. Rpts. 1926, pp. 31, fig. 1; 1927, pp. 38, fig. 1*).—The agronomic activities reported on for 1926 and 1927 were similar in scope to those recorded earlier (E. S. R., 57, p. 33).

The "inoculation" of lucerne (Medicago sativa L.) in Great Britain, H. G. THORNTON (*Jour. Agr. Sci. [England], 19 (1929), No. 1, pp. 48-70, figs. 4*).—Inoculation experiments with alfalfa were made in 39 localities in Great Britain, using the method of Thornton and Gangulee (E. S. R., 55, p. 326). In the west and north of England the treatment insured the crop where untreated alfalfa failed, and generally showed its effects as increased yield or increase in nitrogen content of hay. In the midland and south central counties inoculation usually produced a temporary improvement, untreated alfalfa eventually catching up with the inoculated. The effect was much greater where the young alfalfa had to compete with a cover crop. With inoculated seed chances of success with alfalfa seemed as good in the west and north of England as in the southeast.

How to maintain a supply of pure cotton seed on the farm, P. H. KIME (*North Carolina Sta. Agron. Inform. Circ. 17 (1928), pp. [3]*).—Precautions to be observed include starting with good seed, growing only one variety, careful picking and storing of seed cotton, and proper ginning, cleaning, and storage of seed.

Standardized cotton tare in Egypt, W. I. HOLT (*U. S. Dept. Agr. Circ. 47 (1928), pp. 15, figs. 12*).—Egyptian methods of baling and marketing cotton are described to suggest practical methods for improving the American cotton bale. The Egyptian high density bale weighs about 750 lbs., of which the total tare is 22 lbs. compared with the 26.5 lbs. tare allowed the American square bale of 500 lbs. in export. Advantages of the Egyptian bale include uniformity in dimensions, weight, and density, completeness of protection afforded by the covering, regularity and lightness of tare, square heads, or ends, facilitating storage, and the general neatness of the package.

Improved apparatus and method for making "shellings" of rough rice, W. D. SMITH (*U. S. Dept. Agr. Circ. 48 (1928), pp. 19, figs. 14*).—The Smith shelling device, described and illustrated, with plans and specifications for its construction, is said to remove effectively the hulls from samples of rough rice and to indicate hardness and total yield of the rice. The advantages of the device, the methods for making shellings, and the interpretation of shelling results are treated in detail.

Experiments with sugar beets at the Huntley Branch Station, D. A. SAVAGE and L. POWERS (*Montana Sta. Bul. 215 (1928), pp. 31, figs. 6*).—The effects of crop sequence, manure, alfalfa, continuous cropping, and other practices on sugar beet yields, studied in cooperation with the U. S. Department of Agriculture over an extended period, are reported, and methods are suggested for growing the crop in irrigated rotations and for the control of the sugar beet root louse.

Growing sugar beets continuously and in short rotations just after wheat or oats has resulted in consistently low average yields. Beets produced much more after potatoes than after oats, although beets have given better yields after oats than when grown continuously. They made the heaviest returns in rotations including 3 years of alfalfa or an application of manure to one crop. Sugar beets continuously cropped did not exhaust fertility on the heavy soil type appreciably more than did other crops, and most crops yielded well after sugar beets in rotations.

Liberal application of manure in rotations has resulted in material increases in the yield of sugar beets included, and in most cases other crops in the rotation also benefited from the manure. Although sugar beet yields in unmanured rotations tended to decrease, those in manured rotations were maintained and in some cases markedly increased. The value of direct applications was shown by the average increase of 4.41 tons per acre in rotations (omitting alfalfa) wherein manure was applied directly before beets, while the average increase in similar rotations where beets were one crop removed from manure was 3.06 tons. Thus far the length of rotation has exerted little effect on the influence of manure. Hogging off the corn and the third year alfalfa in the rotation raised the average yield of the beets.

Growing sugar beets in all comparable rotations including alfalfa for the period 1914–1926, inclusive, resulted in an average increase of 2.09 tons per acre, or a gain of 20 per cent due to alfalfa. Beets included in alfalfa rotations yielded higher when grown rather closely after alfalfa. However, it is not advised that beets be grown directly after this crop, since volunteer alfalfa tends to interfere seriously with tillage and the best development of beets. Preferably an intertilled crop such as corn or potatoes, although oats or wheat may be used, should precede beets on alfalfa land. Three years of alfalfa were decidedly more efficient than 2 years of the crop in increasing beet yields. While the systematic use of either alfalfa or manure in irrigated rotations stimulated the growth of sugar beets, manure gave larger yield increases than did alfalfa.

Beets planted about April 20 returned higher yields and sugar contents than did those planted about a month later. Spacing tests in which 13- and 9-in. distances returned maximum yields were in fair accord with usual recommendations. Thinning to the largest plant in the bunch increased yields nearly 2 tons per acre.

Removal of sugar beet leaves from the viewpoint of sugar production [trans. title], J. Souček (*Ztschr. Zuckerindus. Čechoslovak. Repub., 53 (1928), No. 12, pp. 137–147*).—The comparative yields, sucrose content, purity, and sugar production of sugar beets in numerous localities in Czechoslovakia, untreated and with the leaves removed in August or September, indicated that in general removal of leaves constitutes an injury of such significance that the profitableness of the enterprise may be threatened if defoliation is extensive.

Environmental factors influencing wheat production in Maryland, W. B. Kemp and J. E. Metzger (*Maryland Sta. Bul. 297 (1928), pp. 125–173, figs. 13*).—Analyses of yield data from trials of wheat varieties at the station during an extensive period showed that in different years conditions in the soil or in other environmental factors cause changes in the general trend of yields, even though the same varieties are used on identical series or identical plats of a series. Evidently some method of checking must be used each year if the individual $\frac{1}{20}$-acre plat is to be compared fairly accurately. From their mid trend the minor deviations of individual check plats seem to be generally mere chance fluctuations and not worth considering in the correction of yields of plats between checks of these series. Cases cited demonstrate that serious errors may be introduced into the interpretation of variety tests by trying to correct the yields of a group of wheats having one type of response to a check variety with an entirely different response. Comparisons showed that when deviations of individual plats from the mean of duplicates in a type corrected to a check are significantly larger than occur within the check type itself, a different method of correcting should evidently be applied to that type.

An index system outlined measures the relative response of different wheat varieties under different conditions of environment. From a study in the Mediterranean and Fulcaster groups and with Fultz wheat it seemed highly probable that groups could be assembled from strains of one type or from distinct botanical types, even though their components may have statistically different means, and yet all members of a group respond alike to differences on different plat series and in separate seasons or under the wider environmental differences in the various parts of Maryland or in other States. Consequently, tests of only one member of a group may suffice to forecast results obtainable with other members. Study of the annual indices of the several response groups and important varieties suggested that prolonged comparisons are needed to determine accurately the relative productiveness of a variety.

As a rule, Maryland farmers on the well-drained lands of the Piedmont Plateau continue to grow wheats of the Fultz response type, while farmers on the lowlands of the Coastal Plain and of the limestone valleys west of the Piedmont Plateau have replaced these wheats with varieties of the Fulcaster response type. A change occurring in the weather effect upon wheat yields, accompanied by a change in the relative position of the different response groups, as indicated from studies made in the National Herbarium, resemble that expected if *Septoria nodorum* had appeared in the neighborhood of Washington, D. C., about 50 years ago, had slowly spread along the Atlantic seaboard, and had finally crossed the Allegheny Mountains into the Mississippi Valley. The authors conclude that a change occurring in Maryland in recent years in the response to certain environmental conditions has been accompanied by a loss of about 3 bu. per acre or 15 per cent in wheat yields, probably traceable to the prevalence of *S. nodorum*.

Seeds mixture problems: Competition, R. G. STAPLEDON and W. DAVIES (*Welsh Plant Breeding Sta., Aberystwyth,* [*Bul.*], *Ser. H, No. 8* (*1921–1928*), *pp. 162*).—Detailed accounts of the results and their application from extensive investigations concerned with forage production from hay and pasture mixtures of grass and legume seeds under Welsh conditions are presented under the topics of seeds mixture experiments with special reference to the influence of environmental factors, the factor of competition between one species and another in seeds mixtures, and sensible seeds mixtures.

HORTICULTURE

Report of the division of horticulture, W. T. MACOUN ET AL. (*Canada Expt. Farms, Div. Hort. Rpt. 1927, pp. 48, figs. 9*).—The usual annual report (E. S. R., 58, p. 836).

Data are presented on the maintenance costs and returns from a closely planted sod mulch Wealthy apple orchard. Technical descriptions are given of 14 seedling apples originated by the division. Some progress was made in the development of clonal rootstocks of hardy Russian apples. One seedling yielded 21 well rooted shoots by layerage.

Observations on the roots and rooting habits of strawberry plants of various ages are recorded. Cytological studies upon the Pocomoke variety showed the first differentiation of flower buds on September 19. Up to this date runners 8 weeks from rooting differentiated no earlier than did those down to 4 weeks of age. Apparently some unknown seasonal stimulus was lacking up to this time, for after September 19 differentiation was observed in runners only 2 weeks from rooting. A general development of the floral parts followed differentiation, with sepal, petal, stamen, and pistil primordia appearing in the order named. The primary flower developed more rapidly than the secondary and so on. Fall applied fertilizers had more effect on fruit bud formation than did those used in the spring. Nutritional studies with the strawberry are again reviewed (E. S. R., 59, p. 838).

Studies in pure sand cultures of the effect on strawberry plants of withholding nitrogen, potash, or phosphorus at different periods of growth showed (1) the value of a complete nutrient, (2) that phosphorus evidently has more effect on set than either potash or nitrogen, (3) that supplying nitrogen not later than May 2 resulted in normal production, (4) that late applications of phosphorus or potash did not entirely overcome decrements, (5) that in the case of potash there is doubt as to whether spring correction of a deficiency actually benefited yields, and (6) that an excess of nitrogen, phosphorus, or potash resulted in decreased yields of about equal magnitude.

The results of comprehensive tests of sweet corn and garden pea varieties are set forth in tabular form. Rhubarb is considered in respect to varieties, propagation, and winter forcing. Breeding work with sweet corn, peas, tomatoes, onions, eggplant, and white potatoes is discussed. Tomato plants mulched with asphalt impregnated paper greatly outyielded the controls and those mulched with burlap. The soil beneath the paper was filled with a mass of fine feeder roots, and weeds were completely controlled. The paper was, however, of no further use at the close of the test. Notes are given on tests of new vegetables and on the collections of narcissus, iris, perennial phlox, chrysanthemums, and sweet peas.

Types of root growth from cuttings, with special reference to position on the stem, P. W. Zimmerman and A. E. Hitchcock (*Amer. Jour. Bot., 15 (1928), No. 10, p. 626*).—In studies at the Boyce Thompson Institute for Plant Research stem cuttings of woody plants were found to behave in various ways in respect to rooting. Very young cuttings usually rooted first from the basal portion, though as the wood hardened they developed specific peculiarities. Cutting to the node was good practice with some species but had no universal application.

The influence of leaves and buds on the type of roots developed by cuttings, P. W. Zimmerman and A. E. Hitchcock (*Amer. Jour. Bot., 15 (1928), No. 10, pp. 626, 627*).—At the Boyce Thompson Institute for Plant Research cuttings bearing leaves produced in light many main roots having a large number of secondary roots, while cuttings with leaves removed produced main roots with few secondaries. Cuttings in light with buds removed produced fleshy roots with few secondaries. At the end of the test the cuttings with leaves had less starch in the old wood than was found in budless cuttings. The leafy shoots in light had an apparent influence on the type of roots produced, but there was no evident correlation between type of root and carbohydrate supply.

Water intake by cuttings, P. W. Zimmerman and A. E. Hitchcock (*Amer. Jour. Bot., 15 (1928), No. 10, p. 627*).—That water may enter cuttings through leaf scars, leaves, and even the bark, as well as through cut ends, was indicated in experiments at the Boyce Thompson Institute for Plant Research. However, species varied sharply in their capacity to absorb water, some kinds being entirely dependent on the cut end, while others remained turgid with the end sealed.

The nurse-grafted Y-cutting method of plant propagation, W. T. Swingle, T. R. Robinson, and E. May (*Jour. Heredity, 20 (1929), No. 2, pp. 78–94, figs. 6*).—A new and successful method of rooting cuttings is described and discussed.

Propagation as influenced by girdling with a knife or wire [trans. title], [G.] Höstermann (*Ber. Lehr. u. Forschungsanst. Gartenbau Berlin-Dahlem, 1926, pp. 22–28*).—Having pointed out in an earlier paper (E. S. R., 57, p. 138) that *Caragana aborescens* and *Laburnum vulgare* could be propagated successfully by ringing followed by mounding with soil, experiments were continued with 43 species of fruit stocks, fruit varieties, nuts, ornamentals, etc. Six plants, namely, the Quince, Doucin, and Paradise apples, Marianna plum, Golden currant, and poplar rooted without any treatment. Compared with ringing, a tight wire band gave more favorable results, making possible the vegetative propagation of 31 of the 43 species, including such forms as apple, pear, sour cherry, Mahaleb cherry, and damson plum.

Soaked or unsoaked seed [trans. title], A. H. Bremer et al. (*Meld. Norges Landbr. Høiskole, 8 (1928), No. 2, pp. 108–122, figs. 5; Eng. abs., pp. 121, 122*).—In experiments at the Norway Agricultural College it was found that soaking of vegetable seeds in water prior to planting hastened germination and thereby promoted earlier ripening of the resultant crop. Seeds were treated by immersion in water at from 46 to 50° F., followed by maintenance in a moist but unsaturated condition in a darkened chamber at approximately the same temperature as the water until the earliest seeds began to open. The plants resulting from treated seeds had less difficulty with weed competition and hence required less cultural care.

Storage, after-ripening, and germination of apple seeds, W. Crocker (*Amer. Jour. Bot., 15 (1928), No. 10, pp. 625, 626*).—At the Boyce Thompson Institute for Plant Research seeds of *Pyrus baccata*, Patten Greening, and Wealthy apples germinated well after 0.5, 1.5, and 2.5 years of dry storage, provided they were afterripened for about 2.5 months in moist stratification at a low temperature, 0 to 10° C. Afterripening proceeded with about equal rapidity in a considerable pH range. Fully afterripened seeds germinated as low as 0° and thus limited definitely the period of stratification.

Some results of a study of spray residue on apples in 1927, H. C. McLean (*N. J. State Hort. Soc. Proc., 1927, pp. 213–225*).—In experiments at the New Jersey Stations it was found that under rainfall conditions such as prevailed in 1927 two first-brood codling moth sprays could be safely applied without exceeding the tolerance of 0.01 grain of arsenious trioxide per pound of fruit. Finding that small-sized apples may have over 2.5 times as much arsenic residue per unit of weight as large apples, the author points out that the problem of handling small fruited varieties is especially acute. Great variability was noted in the amount of residue on apples of the same size sprayed with the same materials, suggesting the need of uniform spraying practices.

Mechanical cleaning was found generally ineffective, largely because the machines could not reach the interior of the stem and calyx cavities. From repeated analyses it was shown that 45 per cent of the arsenical residue may be on the surface of the fruit and the balance in the two cavities. Hydrochloric acid in concentrations as low as 0.5 per cent was able to remove in a 5-minute period the excess arsenical residue, provided fruits were not too ripe and waxy. An examination of the treated fruits after 7 weeks of storage showed them to be as sound as the untreated, and, furthermore, to have a more attractive appearance.

Maintaining fertility in the orchard, R. D. Anthony (*N. J. State Hort. Soc. Proc., 1927, pp. 206–212*).—A discussion of the fertility problem in the orchard in the light of experimental results obtained by the Pennsylvania Experiment Station over a series of years.

The leaf analysis of various berries [trans. title], Kochs (*Ber. Lehr. u. Forschungsanst. Gartenbau Berlin-Dahlem, 1926, pp. 35, 36*).—Certain well-defined seasonal changes were observed in the composition of the leaves of various species of berries. All varieties tested with the exception of the Jucunda strawberry exhibited a fairly gradual decline in raw protein of the leaves. For example, in the Red Cherry currant the percentage composition of raw protein in the dry matter was 23.89 per cent in May and 13.39 per cent in October. The phosphoric acid content of the leaves varied, so that no definite course of development could be established. In the Jucunda strawberry the range was between 0.66 and 1.08 per cent of the dry matter. Calcium content behaved similarly in the several species, rising gradually from May to October and then declining. In the Jucunda strawberry the percentages were 1.29 in May, 3.14 in September, and 2.14 in October.

The effect of acetylene on the ripening of bananas, R. HARTSHORN (*Amer. Jour. Bot., 15 (1928), No. 10, p. 619*).—As indicated by changes in color, pressure, flavor, starch content, and respiration, acetylene increased the rate of ripening in the banana. The amount of gas was varied widely without altering results.

Cacao research, F. A. STOCKDALE (*Trop. Agr.* [*Ceylon*], *71 (1928), No. 6, pp. 327–342, pls. 5*).—This is a report compiled from notes by the late H. L. van Buuren of a study conducted at the experiment station at Peradeniya, Ceylon, which showed an astounding variation in the progeny of a single mother tree. This variability is held to support earlier views on the hybrid origin of the cultivated cacao. The outstanding characters used in the study were fruit shape, character of the surface, and the color of the cotyledons.

The second centennial of coffee in Brazil [trans. title] (*Bol. Mus. Nac.* [*Rio de Janeiro*], *3 (1927), No. 4, pp.* [*3*]*+352, pls. 6*).—This memorial prepared in honor of the two hundredth anniverary of the introduction of coffee into Brazil contains papers on the historical aspects, botany, culture, utilization, etc.

Dahlias, F. F. ROCKWELL (*New York: Macmillan Co., 1929, pp. X+85, figs. 19*).—A small handbook relating to types, varieties, propagation, culture, and display.

Effect of chemicals, temperature, and humidity on the lasting qualities of cut flowers, A. E. HITCHCOCK and P. W. ZIMMERMAN (*Amer. Jour. Bot., 15 (1928), No. 10, p. 628*).—Of 44 chemicals tested for their ability to prolong the life of cut flowers, none was effective. Low temperature, from 3 to 10° C., was found a satisfactory means of keeping flowers, but following removal from storage flowers did not keep as well as fresh-cut material.

FORESTRY

Transactions of the First International Congress of Silviculture (*Actes du 1. Congrès International de Sylviculture, Rome, 1926. Rome: Inst. Internatl. Agr., 1926, vols. 1, pp. 320; 2, pp. 780, pls. 7, fig. 1; 3, pp. 744, pls. 33, figs. 47; 4, pp. 749, pls. 83, figs. 15; 5, pp. 761, pls. 66, figs. 15*).—These volumes cover the transactions of the First International Congress of Silviculture held at Rome, Italy, April 29 to May 5, 1926, and include papers on the forest resources of the world, on silviculture in the various countries, control of insect and fungus pests, etc.

Forest plantation experiments on the Choctawhatchee National Forest, E. W. GEMMER (*Jour. Forestry, 26 (1928), No. 8, pp. 1058, 1059*).—A comparison of five methods of planting, (1) under living brush, (2) in grassy openings from which root competition was eliminated by trenching, (3) in plowed land, (4) in plowed land covered with oak brush, and (5) on cleared unplowed land covered with oak brush, showed the highest survival of long-leaf pine in the plowed land with brush cover. In the case of slash and Monterey pines the best survival was in the plowed land without brush. Cypress survived best in natural brush.

The root system of the hazel, E. G. Cheyney (*Jour. Forestry, 26 (1928), No. 8, pp. 1046, 1047*).—Observing that dense thickets of hazel, *Corylus americana* and *C. rostrata*, were able to prevent the establishment of pines and other conifers, a study was made at the Cloquet Forest Experiment Station, Minnesota, upon the root system of a large hazel bush composed of 59 stems varying in length from 6 in. to 8 ft. and growing in a coarse sand grading into gravel in small pockets. Roughly the roots occupied a rectangular space 15 by 18 ft. An estimate of the total root length gave 7,529 ft., suggesting that root competition may very well be an important factor in limiting the life of pine seedlings in hazel brush. When the roots of fern, blueberry, honeysuckle, and many other smaller plants are considered, such a situation seems highly probable.

Increased growth of released hemlock, H. J. Lutz (*Jour. Forestry, 26 (1928), No. 8, pp. 1047–1049*).—That hemlock, despite its tolerance to shade and ability to survive under close competition with other species, may benefit decidedly from release was indicated in an examination of 38 hemlock stumps in a cutting made in Forest County, Pennsylvania. The hemlock grew almost 3.5 times as fast after release as before, the greatest benefit occurring in trees under 5 in. in diameter. However, the actual rate of diameter growth was higher both before and after release in trees above 5 in. The rate of growth under suppression was directly proportional to the stump diameters of the trees.

The growth of eucalypts on the high veld and south-western mountain veld of the Transvaal, J. J. Kotze and C. S. Hubbard (*Union So. Africa, Forest Dept. Bul. 21 (1928), pp. 59, pls. 8*).—In addition to descriptions of the region and of the species which have been tried and found worthy of trial general information is presented on silvicultural practices.

DISEASES OF PLANTS

Achromatic variations in pathogenic fungi, P. D. Caldis and G. H. Coons (*Mich. Acad. Sci., Arts, and Letters, Papers, 6 (1926), pp. 189–236, pls. 11, figs. 2*).—White variants were isolated from single spore cultures of *Septoria apii*, *Sphaeropsis malorum*, *Colletotrichum lindemuthianum*, and *Cladosporium fulvum*. Variants from the first two named reverted at once to the parent form; though from the other two, strains were obtained which remained constant on laboratory media for more than two years. These lacked the characteristic color and sporulation of the parent forms. Nutrients, illumination, and reaction all failed as controlling factors (so far as producing variants was concerned). The variants were still pathogenic to their respective hosts, but the disease produced by the *C. fulvum* variant was unlike that produced by the typical *C. fulvum*. All the forms eventually regained the color of the parent form, but not the capacity for spore production. The variants are regarded as modified forms showing behavior analogous to that of so-called Abkulturs of Fusarium and the so-called attenuated cultures of fungi and bacteria.

Studies on Colletotrichum lindemuthianum and Gloeosporium fructigenum hollandica n. var., H. R. A. Muller (*Onderzoekingen over Colletotrichum lindemuthianum (Sacc. et Magn.) Bri. et Cav. en Gloeosporium fructigenum Berk. Forma Hollandica nova Forma. Proefschr., Landb. Hoogesch., Wageningen, 1927, pp. [4]+93, pls. 16*).—This is a Wageningen thesis.

Cultural life-histories of Diaporthe, I, L. E. Wehmeyer (*Mich. Acad. Sci., Arts, and Letters, Papers, 6 (1926), pp. 377–396, pls. 4*).—Studies are indicated to show that although Diaporthe and Melanconis have not been satisfactorily differentiated heretofore, yet certain correlated characters exist both in the perithecial and in the conidial stage which segregate these genera to form two distinct groups. These correlations are claimed to hold throughout the five species of which the life histories are here given.

D. pruni, *D. faginea*, *D. arctii*, and an unidentified Diaporthe on *Carya glabra*, all of which show a differentiated light colored entostromatic area bounded by a blackened marginal zone, produced an imperfect stage of the form genus Phomopsis. *D. marginalis* produced a conidial stage belonging in the form genus Melanconium. This correlation of characters in the perithecial and conidial stages coincides with groups of characters said to have been suggested previously by the author for the separation of the genera Melanconis and Diaporthe. Since it is typical of the genus Melanconis, *D. marginalis* becomes *M. marginalis* n. comb. and *Cytospora pruni* becomes *Phomopsis pruni* n. comb.

Some observations on the oospores of Phytophthora species, W. C. Lester-Smith (*Ann. Roy. Bot. Gard. Peradeniya* [*Ceylon Jour. Sci., Sect. A*], *10* (*1927*), *No. 3, pp. 243–257, pls. 2*).—An account of cultural and comparative study of Phytophthora forms is detailed, and the theory is advanced that the development of oospores by strains or species of Phytophthora is due to the influence of environment on the rate of metabolism of the thallus.

Some investigations into conditions affecting the parasitism of Rhizoctonia solani Kühn, M. Park (*Ann. Roy. Bot. Gard. Peradeniya* [*Ceylon Jour. Sci., Sect. A*], *10* (*1927*), *No. 3, pp. 259–273, figs. 3*).—In experimentation which is described an attempt was made to determine the effect, on the parasitism of *R. solani* attacking cotton seedlings in inoculated soils, of a varying soil moisture in air during a humid period, of a varying soil moisture in air during a dry period, and of standard soil moisture in atmospheres of varying humidity.

"It has been found that, in the range of soil moisture necessary for the successful development of cotton seedlings, a variation of water content of the soils has little or no effect on the extent of infection of the seedlings. On the other hand, variations of the humidity of the atmosphere above the soil have an effect, and results obtained indicate that infection increases with an increase of humidity. Recommendations are made for the practical application of the results obtained."

Physiologic races of bunt of wheat, G. M. Reed (*Amer. Jour. Bot., 15* (*1928*), *No. 2, pp. 157–170*).—The behavior, as regards resistance to *Tilletia laevis* and *T. tritici*, is said to have been essentially the same in the wheat varieties Dawson, Fultz, Harvest Queen, Leap, Mealy, Mediterranean, and Poole. Fulcaster and Red Wave gave variable and rather low results in 1927. The differences in the behavior of the smut collections were brought out with Kanred, Turkey, Hussar, Martin, and Odessa, and it is held that physiologic specialization occurs among these forms. *T. laevis* is said to differentiate distinctly at least 4 specialized races, and *T. tritici* is thought to have differentiated clearly 6 races. Additional experiments may, it is thought, differentiate other races.

Blight and leaf-spot of carrot in Massachusetts, W. L. Doran and E. F. Guba (*Massachusetts Sta. Bul. 245* (*1928*), *pp. 269–278*).—Blight and leaf spot of carrot are said to be foliage diseases which occur in Massachusetts with varying degrees of severity according to the character of the season. The diseases usually cause no measurable loss on pulled young carrots, and on late carrots they cause little injury in yield in dry summers, but from moderate to heavy loss in rainy seasons. In Massachusetts summer temperature was found to be a less important factor in influencing the development of these diseases than moisture. Both fungi were found to pass the winter on dead leaves of carrots on or in the soil.

The fungi were both found very susceptible to copper fungicides, and while it is not recommended that carrots be regularly sprayed, in rainy summers when blight was severe increases in yield resulted from spraying with Bordeaux mixture. Late sowings of carrots are said to be less subject to blight, because of the relative resistance to infection of younger leaves and the unfavorable temperatures prevailing late in the crop growth.

Fruit diseases of chillies, L. S. Bertus (*Ann. Roy. Bot. Gard. Peradeniya* [*Ceylon Jour. Sci., Sect. A*], *10* (*1927*), *No. 3, pp. 295–314, pls. 2*).—In 1923 a disease was reported as found on chili fruits in plats at Peradeniya, and subsequent work revealed the presence of *Vermicularia capsici*, *Colletotrichum nigrum*, and *Gloeosporium piperatum*. *Colletotrichum* sp. showed a nonperithecial strain and a perithecial strain, the perfect stage of the latter being identified as *Glomerella piperata*, with no perfect stage on the fruit or in culture. Possible relations or identities are discussed.

Control of red spider and powdery mildew on greenhouse cucumbers, W. D. Whitcomb and E. F. Guba (*Massachusetts Sta. Bul. 246* (*1928*), *pp. 279–294, pl. 1, figs. 3*).—Large losses in yield and reduction in the quality of greenhouse cucumbers are said to result from attacks of red spider and powdery mildew. To prevent these losses the authors suggest proper greenhouse sanitation, and for the control of red spider, spraying with a highly refined white mineral-oil emulsion which is free from injurious carbolic or cresylic compounds. For the control of powdery mildew, proper greenhouse management and the use of small amounts of high-grade dusting sulfur are recommended. In cool, cloudy weather, or if powdery mildew is particularly troublesome, sprays of copper fungicides or potassium sulfide may be applied. When both pests are present, it is recommended that the plants be sprayed with a highly refined white mineral-oil emulsion and dusted with a low free sulfur content dust during bright, warm weather. In dull, cool weather, or if powdery mildew is troublesome, the plants may be sprayed with a copper fungicide combined with highly refined white mineral-oil emulsion.

As precautionary measures, the authors suggest that fumigation with hydrocyanic acid gas should not be done so long as there is residue from copper fungicides on the leaves. Spraying should not be done with highly refined white mineral-oil emulsion if there is any residue from high free sulfur content dusts on the leaves.

The grey mould of hops, H. Wormald and W. F. Cheal (*Jour. Min. Agr.* [*Gt. Brit.*], *33* (*1926*), *No. 5, pp. 456–458, pl. 1*).—In September, 1924, while examining a bed of young hop plants in a weedy situation for downy mildew (*Pseudoperonospora humuli*) the authors found a leaf blotch which is described and which showed the presence of *Botrytis cinerea*. The characters of the disease are described as found on three varieties only, Tutsham, Cobbs, and Tolhurst. On a diseased hop kept in moist atmosphere for about a fortnight the fungus produced sclerotia.

Hollow heart in potatoes, H. C. Moore (*Mich. Acad. Sci., Arts, and Letters, Papers, 6* (*1926*), *pp. 289–294*).—Observation and experimentation appear to show that potato hollow heart may be correlated with excess of rainfall or irrigation. Other factors may include temperature, soil type, chemical fertilizers, and cultivation. Suggestions are offered.

The relation of sodium nitrate and certain other nitrogen carriers to the development of chlorosis in rice, W. H. Metzger and G. Janssen (*Jour.

Agr. Research [*U. S.*], *37* (*1928*), *No. 10*, *pp. 589–602*).—As a result of their investigations, the authors suggest that chlorosis in rice is due to insufficient available nitrogen, particularly ammonia.

From studies of the soil reaction and nitrogen changes in greenhouse and field soils, it was found that sodium nitrate and other nitrates were rapidly reduced in submerged soils and that nitrogen was lost in the reduction process by denitrification. Ammonification progressed slowly for the first 4 or 5 weeks following submergence, except where there was an abundance of organic matter. Consequently, the plants suffered from lack of available nitrogen and became chlorotic. The soil reaction was found to be changed toward alkalinity by flooding, and sodium nitrate had a slight tendency to hasten this change, while ammonium sulfate retarded it. Chlorosis became marked in nearly all cases before the soil reaction reached pH 6.0. Where there was an abundance of organic matter in the soil chlorosis did not appear, and this was believed to be due to ammonia liberated from the organic matter.

As a result of their investigations, the authors state that sodium nitrate or other nitrate salts can not be recommended for rice fertilization. If it were used, it would be most economical to apply it in several applications in order to minimize the loss from denitrification.

Nematodes inhabiting the cysts of the sugar-beet nematode (Heterodera schachtii Schmidt), G. THORNE (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 10*, *pp. 571–575*, *figs. 3*).—The author reports having found, while studying dormancy in *H. schachtii*, that a considerable number of cysts contained other species of nematodes, and an investigation was made of this infestation to determine its possible economic importance.

While *Cephalobus oxyuroides*, *Acrobeles butschlii*, and other species were found occurring in considerable numbers in Heterodera cysts, the examination did not indicate that they were of much importance in controlling the sugar beet nematode.

Plasmopara downy mildew of cultivated sunflowers, P. A. YOUNG and H. E. MORRIS (*Amer. Jour. Bot.*, *14* (*1927*), *No. 9*, *pp. 551, 552*, *pl. 1*).—Sunflower downy mildew, due to *P. halstedii*, is said to have been reported from Indiana, Iowa, Minnesota, New York, and at Bozeman, Mont.

P. halstedii is believed, but has not yet been fully proved, to overwinter in diseased sunflower seeds. Evidences are discussed. The histological characters of *P. halstedii* in sunflower leaves are said to be similar to the characters of some other species of Plasmopara.

Further studies in the ring-spot disease of tobacco, C. N. PRIODE (*Amer. Jour. Bot.*, *15* (*1928*), *No. 1*, *pp. 88–93*, *figs. 6*).—A careful study of symptoms of tobacco ring-spot disease as set forth in a paper previously noted (E. S. R., 59, p. 850) led to the view that this belongs in the category of virus diseases. The object of the present account is to report the results of further studies on this disease.

It is stated that ring-spot inoculations produce localized infections within from 3 to 5 days, and systemic symptoms a few days later. Rings appeared around needle-prick inoculations both on tobacco and petunia. In addition, infection was produced on beet, pokeweed, and New Zealand spinach, which also developed the symptoms on the stems. Dried diseased material did not give infection. Juice stored at —5° C. produced infection when applied to plants 85 days after extraction, but at higher temperatures virulence rapidly decreased. The infectious principle in juice from ring-spot tobacco plants does not pass a Berkefeld filter of grade "N."

Multiplication of the virus of tobacco mosaic in detached leaves, H. A. PURDY (*Amer. Jour. Bot.*, *15* (*1928*), *No. 1*, *pp. 94–99*, *fig. 1*).—The results of preliminary tests having indicated that a multiplication of mosaic virus occurs in tobacco leaves detached just prior to inoculation, confirmation was sought by means of serial transmission experiments, and it is claimed to have been found that the causal agent of tobacco mosaic multiplies in the detached leaves. The presence or absence of virus in each detached leaf was determined by the capability of the extracted sap to induce mosaic in healthy tobacco or tomato plants.

The improbability of tobacco mosaic transmission by slugs, H. A. Purdy (*Amer. Jour. Bot., 15 (1928), No. 1, pp. 100, 101, fig. 1*).—In a total of 23 attempts to transmit mosaic through slugs by transferring them after they had fed upon diseased plants directly to healthy plants, no case of infection resulted. However, when the bits of green plant tissue obtained by macerating slugs which had fed upon mosaic material were inoculated into healthy plants, infection was readily produced.

Grey blight of tea and coconut—a comparative study, L. S. Bertus (*Ann. Roy. Bot. Gard. Peradeniya [Ceylon Jour. Sci., Sect. A], 10 (1927), No. 2, pp. 197–241, pls. 6*).—As the result of a study to determine just what species of Pestalozzia are causal in tea gray blight, it is stated that *P. theae* is able to infect tea and coconut leaves through a wound but not to penetrate the healthy leaf under ordinary conditions. *P. palmarum* inoculated onto the unwounded upper or lower surface of coconut leaves failed to infect, though inoculations after wounding were all successful. Both on upper and on lower surfaces of tea leaves, whether wounded or unwounded, *P. palmarum* failed to infect. It is thought that *P. palmarum* can not penetrate healthy coconut tissue under the experimental conditions herein employed, and that this fungus is not parasitic on tea.

A Fusarium disease of dadap (Erythrina lithosperma), M. Park (*Ann. Roy. Bot. Gard. Peradeniya [Ceylon Jour. Sci., Sect. A], 10 (1927), No. 3, pp. 275–293, pl. 1, figs. 4*).—Following the receipt of specimens of diseased dadap (*E. lithosperma*) from estates having several diseased trees in 1924 and later, an investigation showed that the outbreak occurs particularly after lopping in wet weather. A Fusarium isolated from diseased tissue was shown to be causal. A study of spore lengths developed on different media shows that there is for each medium tested a period of adolescence, one of optimum growth, and one of retrogression. The factors influencing these periods are discussed. Control measures recommended include avoidance of lopping in wet weather and removal and destruction of affected material.

The fungi associated with disease in vanilla, T. Petch and C. Ragunathan (*Ann. Roy. Bot. Gard. Peradeniya [Ceylon Jour. Sci., Sect. A], 10 (1927), No. 2, pp. 181–196, pls. 2*).—A brief outline history is given of vanilla fungus diseases during approximately the last 50 years.

Leaf rot of the carnation, E. S. Salmon and W. M. Ware (*Gard. Chron., 3. ser., 81 (1927), Nos. 2099, pp. 196, 197, fig. 1; 2100, p. 216, figs. 2*).—A rotting disease, supposedly new in this region and very disadvantageous to carnation culture, is described in connection with the causal organism. This is said to have been described previously as *Pseudodiscosia dianthi*, and is described in this article by the authors as examined after being found on affected plants near Brighton.

Diseases of lilies, A. Grove (*Gard. Chron., 3. ser., 81 (1927), Nos. 2098, pp. 178, 179; 2099, pp. 197, 198*).—Mentioning that Massee had stated, in a paper which was noted (E. S. R., 14, p. 49), that of the 45 fungi known to grow on lilies throughout the world only *Botrytis cinerea*, *Uromyces erythronii*, and *Rhizopus necans* are destructive, but that the first named was particularly so and is as yet the only one of these fungi known to have assumed epidemic activity in England, the author gives an account of this fungus in this connection.

A disease of the Douglas fir and other conifers, M. J. F. WILSON (*Gard. Chron., 3. ser., 83 (1928), No. 2146, p. 105, figs. 2*).—Giving results of his investigation of species of Dermatea on Douglas fir and other conifers, the author states that fungi which have been identified as *D. livida* can be divided into two groups according to ascospore size. The form having the smaller ascospores disagrees with previous descriptions, and must probably be regarded as a new species. The conidial stage of this fungus was proved by cultural work to be *Myxosporium abietinum*. *D. eucrita* showed no definite evidence of parasitism on Douglas fir. *D. livida* appears to be purely saprophytic, having been found only on dead branches of Scotch pine. It forms in culture a Myxosporium stage. The fungus previously confused with *D. livida* may attack Douglas fir when weakened by unfavorable conditions. Of numerous inoculation attempts carried out on Douglas fir, *Abies pectinata, Cupressus lawsoniana*, and *Pinus sylvestris*, none have produced infection. Judging by field observations, this is parasitic only in case of host weakness.

ECONOMIC ZOOLOGY—ENTOMOLOGY

How animals find their way about: A study of distant orientation and place-recognition, E. RABAUD, trans. by I. H. MYERS (*New York: Harcourt, Brace & Co.; London: Kegan Paul, Trench, Trubner & Co., 1928, pp. IX+142, figs. 30*).—This work is presented under the headings of the problem and the method, and orientation (1) among flying insects, (2) in walking insects, (3) in other invertebrates, and (4) in the vertebrates. The work concludes with a general summary, a 4-page list of references, and a general index.

Hess-Beck's forest protection.—I, Protection against animals, M. DINGLER (*Hess-Beck Forstschutz. I. Band, Schutz gegen Tiere. Neudamm: J. Neumann, 1927, 5. ed., vol. 1, pp. XX+588, figs. 400*).—This revision of the first of a two-volume work (E. S. R., 35, p. 648) deals with the protection of forests against animals. Protection against mammals is first considered (pp. 11–102), followed by a discussion of protection against birds (pp. 103–118). The remainder of the work deals largely with protection against insects, the arrangement being by orders.

The rabbit pest in Australia, J. MAITHAMS (*Melbourne: Specialty Press Pty., 1921, pp. 264, pls. 7, figs. 13*).—This account of the rabbit as a pest in Australia and means for its control includes chapters on foxes, dingoes or wild dogs, wombats, the Fences Act (Victoria), and noxious weeds.

Longevity of birds in captivity, C. E. BROWN (*Auk, 45 (1928), No. 3, pp. 345–348*).—This is a report of records kept at the Zoological Gardens, Philadelphia, Pa., of 67 different species.

A bibliography of bird banding in America, F. C. LINCOLN (*Auk, 45 (1928), Sup., pp. 73*).—The bibliography here presented consists of 513 titles and represents all those at present known to the author. A chronological and a subject index are included.

The fall food habits of the ruffed grouse in the Syracuse area of New York, R. A. JOHNSON (*Auk, 45 (1928), No. 3, pp. 330–333*).—In examinations made of 26 crops of ruffed grouse only 3 were found to contain animal matter, and 2 of these contained less than 10 per cent of insect material.

Birds of New Mexico, F. M. BAILEY (*[Santa Fe]: N. Mex. Dept. Game and Fish, 1928, pp. XXIV+807, pls. 79, figs. 198*).—This volume, the first comprehensive report on the bird life of the southwestern United States, is based mainly on field work by the U. S. D. A. Bureau of Biological Survey. In the introduction the author considers the distribution of birds in New Mexico, the value of birds to the State, National and State refuges and State organizations for the conservation of wild life, birds first described from New Mexico, and location of collections made in that State. This is followed by itineraries and reports of field work in the State (pp. 15–36) and localities visited by observers (pp. 37–68), both by the late W. W. Cooke, together with a glossary of technical terms. The birds of New Mexico are then dealt with at length by the author, with State records by Cooke. A list of the literature cited (pp. 763–792), periodicals (p. 793), abbreviations (p. 794), and a subject index are included. The numerous colored plates of birds are by A. Brooks, with one by L. A. Fuertes.

Destructive and useful insects: Their habits and control, C. L. Metcalf and W. P. Flint (*New York and London: McGraw-Hill Book Co., 1928, pp. XII+918, figs. 561*).—This work, intended as a text for the beginning student in entomology and also as a guide or reference book for practical farmers, gardeners, fruit growers, farm advisers, physicians, and general readers, deals with the subject under the following headings: Insects as enemies of man (pp. 1–33); the value of insects to man (pp. 34–68); the external morphology of insects (pp. 69–86); the internal anatomy and physiology of insects (pp. 87–107); the mouth parts of insects (pp. 108–129); development and metamorphosis (pp. 130–152); the place of insects in the animal kingdom (pp. 153–169); the orders of insects (pp. 170–228); insect control (pp. 229–277); apparatus for applying insecticides (pp. 278–297); insects injurious to corn (pp. 298–353); insects injurious to small grains and forage grasses (pp. 354–379); insects injurious to legumes (pp. 380–408); cotton insects (pp. 409–422); tobacco insects (pp. 423–430); insects injurious to vegetable gardens and truck crops (pp. 431–519); insects injurious to deciduous fruits and bush fruits (pp. 520–646); citrus insects (pp. 647–658); insects attacking shade trees and shrubs (pp. 659–695); greenhouse insects (pp. 696–730); household insects, and pests of stored grains, seeds, and cereal products (pp. 731–766); insects injurious to domestic animals (pp. 767–823); and insects that attack and annoy man and affect his health (pp. 824–860).

The work includes synopses of several of the more important orders of insects, field keys for the identification of insects injuring various crops, products, etc., and a subject index of 58 pages.

[Studies of insect ecology] (*Ecology, 9 (1928), No. 4, pp. 367–379, figs. 5; 383–403, pl. 1, fig. 1; 461–466; 505–526*).—Four contributions relating to insect ecology are presented, as follows: Evolutionary Level in Relation to Geographic, Seasonal, and Diurnal Distribution of Insects, by C. H. Kennedy; Seasonal Distribution and Life History of *Notonecta undulata* in the Winnipeg Region, Canada, by L. B. Clark; Increase of Insect Transmitted Plant Disease and Insect Damage through Weed Destruction in Tropical Agriculture, by G. N. Wolcott; and Flowers and Insects, XXV, by C. Robertson (E. S. R., 57, p. 57).

A method for the approximate calculation of the progress of introduced parasites of insect pests, W. R. Thompson (*Bul. Ent. Research, 17 (1927), No. 3, pp. 273–277*).—This is a contribution from the U. S. D. A. Bureau of Entomology, in which a mathematical method is described.

Report of assistant entomologist, Vernon, M. H. Ruhmann (*Brit. Columbia Dept. Agr. Ann. Rpt., 22 (1927), pp. 37–41*).—This report (E. S. R., 59, p. 352) deals particularly with baits for the control of wireworms, the details of which work are presented in tabular form.

Entomology of Haiti, G. N. Wolcott (*Entomologie d'Haïti. Port au Prince: Serv. Tech., Dept. Agr. et Enseig. Prof., 1927, pp. 440, figs. 33*).—The four parts of this work are as follows: Introduction, relations, anatomy, physiology, and development (pp. 9–56); ecology of insects (pp. 57–128); orders of insects (pp. 129–367); and entomology for the farmer (pp. 368–418).

[Report of entomological work in South Africa] (*Farming in So. Africa, 3 (1928), No. 32, pp. 1087–1089*).—This is a brief report of the occurrence of and work with the more important insect pests of the year.

Some insects associated with cotton in Papua and the mandated Territory of New Guinea, E. BALLARD (*Bul. Ent. Research, 17 (1927), No. 3, pp. 295–300, pl. 1*).—This is a preliminary list of cotton pests of Papua and New Guinea, with notes on distribution and behavior.

Sugar cane insects around the world, T. E. HOLLOWAY (*Honolulu: Honolulu Iron Works Co., 1928, pp. 37*).—This is a practical account which also includes a discussion of the methods of controlling sugar-cane insects, plant quarantines to protect the sugar industries, economic entomology in the sugar industry, the plantation entomologist, etc.

Minor pests of cacao, G. S. COTTERELL (*Gold Coast Dept. Agr. Bul. 13 (1928), pp. 100–106, pls. 4*).—A brief account is given of some of the less important insects of cacao, particular mention being made of *Helopeltis bergrothi* Reut., the cacao aphid (*Toxoptera aurantia* Boy.), and the cacao psylla (*Mesohomotome* (*Udamostigma*) *tessmanni* Aulm.).

A micro-technique for observing oil penetration in citrus leaves after spraying, H. KNIGHT (*Science, 68 (1928), No. 1771, p. 572*).—On account of the rapidly increasing use of oil in spray mixtures, often resulting in injury to leaves, fruits, and trees, a study was made of the penetration and disposition of the oil within citrus leaves after spraying. A description is given of the technique adopted.

By employing this technique the author claims to have observed the penetration of oil into the leaf, and its translocation through the vascular system into the stem and across the medullary rays to its final deposition in the storage cells of the pith and old wood fibers. Oils of high viscosity are said to choke the vascular system to a greater or less degree, depending upon the amount of oil, for an indefinite period of time.

The termite problem in the Pacific, T. E. SNYDER (*Mid-Pacific Mag., 37 (1929), No. 1, pp. 17–26, figs. 13*).—This is a discussion of the problem as applied to the Pan-Pacific area.

The Mallophaga of sand-grouse, J. WATERSTON (*Zool. Soc. London, Proc., 1928, II, pp. 333–356, figs. 10*).—The author reports upon examinations made of 16 known species of Pteroclidae and reports upon 14 species of Mallophaga, representing 2 genera, both peculiar to sand grouse, which have been collected from 14 host species. The methods of collection and preparation are described, and a list is given of hosts and parasites. The new genus Syrrhaptoecus is erected and 12 species are described as new.

The European earwig (Forficula auricularia Linn.), H. C. ATWELL (*Oreg. Bd. Hort. Bien. Rpt., 19 (1925–26), pp. 86–103, figs. 5; abs. in Rev. Appl. Ent., 16 (1928), Ser. A, No. 3, pp. 105, 106*).—This is a practical summary of the present status of knowledge of the European earwig in the Northwest and of the means for its control.

Locusts and their control, B. P. UVAROV (*Nat. Hist. Mag., 1 (1928), No. 8, pp. 298–306, figs. 4*).—This is a brief summary of the present knowledge of the locust problem.

The grape thrips (Drepanothrips reuteri Uzel), D. MOULTON (*Calif. Dept. Agr. Mo. Bul., 17 (1928), No. 8, pp. 455–457, figs. 2*).—This is a brief account of *D. reuteri*, which was first found in California in 1926 damaging Tokay and Emperor grapes in the Florin district in Sacramento County. The thrips attack the green shoots and unfolding leaves and later sear the berries.

The red banded cacao thrips, Heliothrips rubrocinctus Giard, G. S. Cotterell (*Gold Coast Dept. Agr. Bul. 13 (1928), pp. 94–99, pl. 1*).—An account of this enemy of cacao in the Gold Coast, where the adults and nymphs injure the plant by sucking the underside of the leaves and pods. Artificial control measures are said to be impracticable in that country, though the application of a 2 per cent solution of lime or kaolin acts as a preventive against oviposition.

Records of Australian Thysanoptera (thrips), IV, A. A. Girault (*Queensland Agr. Jour., 30 (1928), No. 4, pp 325–330*).—This is in continuation of the parts previously noted (E. S. R., 60, p. 61).

The morphology of the Cicadidae (Homoptera), J. G. Myers (*Zool. Soc. London, Proc., 1928, II, pp. 365–472, figs. 75*).—An extended account of anatomical studies of this important family of Homoptera.

Minutes and proceedings of the Froghopper Investigation Committee, I–XII, W. G. Freeman et al. (*Trinidad: Govt., 1925–1928, pts. 1, pp. 23; 2, pp. 25–39; 3, pp. 41–59; 4, pp. 61–98; 5, pp. 99–140; 6, pp. 141–177, figs. 7; 7, pp. 179–210; 8, pp. 211–258; 9, pp. 259–306, pl. 1; 10, pp. 307–351, pls. 2; 11, pp. 1–35; 12, pp. 37–112*).—This is a report of the proceedings of the meetings held by the committee appointed by the Governor of Trinidad for investigation of the froghopper *Monecphora* (*Tomaspis*) *saccharina* Dist. problem.

A study of the biology and morphology of the woolly apple aphid, Eriosoma lanigerum (Hausm.) [trans. title], P. Marchal (*Mém. Agr. [France] Ann. Épiphyties, 14 (1928), No. 1, pp. 106, figs. 37*).—The several parts of this work deal with the life cycle of the woolly apple aphid in America, its introduction and dissemination in Europe and other parts of the world, its life history in Europe, the morphology of the different forms in its life cycle, the biology of the different forms in its life cycle, its effect on the plant, and host plants. A bibliography of six pages is included.

The external morphology and life-history of the coccid bug Orthezia urticae Linn., E. K. Sikes (*Zool. Soc. London, Proc., 1928, II, pp. 269–305, pls. 2, figs. 23*).—This is a report of studies of the coccid *O. urticae*, which was collected and reared in the laboratory with a view to investigating the number of instars and the morphology. The account includes a list of 34 references to the literature.

An important parasite of the greenhouse white-fly (Trialeurodes vaporariorum Westwood), E. R. Speyer (*Bul. Ent. Research, 17 (1927), No. 3, pp. 301–308, pls. 3*).—This is a contribution from the Experimental and Research Station, Cheshunt, Herts, England, on *Encarsia formosa* Gahan, a single female of which oviposits in 50 or more young pupae of the host. The larva of the parasite, on hatching from the egg, destroys the greenhouse whitefly pupa, the skin of which becomes black in color, thus distinguishing the parasitized pupa from the normal white scales and pupa of the white fly. The parasite is said to be parthenogenetic. The larval cycle is passed in 28 or more days.

Description of a new white fly pest of rhododendrons, F. Laing (*Ent. Mo. Mag., 3. ser., 14 (1928), No. 166, pp. 228–230, fig. 1*).—Under the name *Dialeurodes chittendeni* n. sp., the author describes a form that occurs on *Rhododendron ponticum* and *R. jacksoni* in Ascot and Sunningdale, England.

The fig wax scale (Ceroplastes rusci L.) in Palestine, G. E. Bodkin (*Bul. Ent. Research, 17 (1927), No. 3, pp. 259–263, pl. 1, fig. 1*).—An account of the most important of several pests of the fig, of which some 11 species are grown in Palestine. A technical description of *C. rusci*, by F. Laing, is appended.

Notes on the anatomy of Warajicoccus corpulentus Kuwana, a scale insect noxious to various oaks, Z. Kitao (*Jour. Col. Agr., Imp. Univ. Tokyo,* *10 (1928), No. 1, pp. 1–20, figs. 29)*.—This is a report of an anatomical study of a coccid that is found in abundance in Tokyo attached to the stems of oaks.

The Aegeriidae or clearwing moth occurring in Oregon, B. G. THOMPSON (*Oreg. Bd. Hort. Bien. Rpt., 19 (1925–26), pp. 125–138, figs. 5*).—This is an account of a lepidopterous family of which the larvae of all the species occurring in Oregon are internal plant borers. The pests considered include the wild cucumber root borer (*Melittia gloriosa* (Hy. Edw.)), the raspberry root borer, the poplar tree borer (*Aegeria tibialis* (Harr.)), the strawberry crown borer (*Synanthedon rutilans* (Hy. Edw.)), the currant borer, *S. tacoma* (Beuten.), the Douglas fir pitch moth (*S. novaroensis* (Hy. Edw.)), the alder tree borer (*S. americana* (Beuten.)), the pine sesiid (*Vespamima sequoiae* (Hy. Edw.)), the peach and prune root borer (*S. opalescens*), *S. graefi* (Hy. Edw.), and *Paranthrene robiniae* (Hy. Edw.).

[Report of the fourth annual conference of the International European Corn Borer Organization] (*Internatl. European Corn Borer Organ. Ann. Conf. [Rpt.], 4 (1928), pp. [1]+66*).—This is a mimeographed report of the fourth annual conference (E. S. R., 59, p. 655) held at Toledo, Ohio, September 27 and 28, 1928.

[Progress of work with the European corn borer] (*Jour. Amer. Soc. Agron., 20 (1928), No. 10, pp. 997–1047, figs. 8*).—Three papers on the European corn borer are here presented, namely: Recent Developments in Entomological Research on the Corn Borer, by D. J. Caffrey (pp. 997–1010); Agronomic Research on the European Corn Borer in Ohio, by R. M. Salter, L. E. Thatcher, and J. T. McClure (pp. 1011–1032); and Cooperation in Corn Borer Research, by C. R. Ball (pp. 1033–1047).

International corn borer investigations: Scientific reports, 1927–1928, edited by T. ELLINGER (*Internatl. Livestock Expo. [Chicago], Internatl. Corn Borer Invest. Sci. Rpts. 1927–28, pp. [11]+237, pls. 4, figs. 99*).—This is a report of the International Corn Borer Investigations organized early in 1927 by the International Live Stock Exposition with the financial support of numerous leaders of industrial and financial corporations in Chicago (E. S. R., 58, p. 7). The reports presented include the following:

Biological Researches on *Pyrausta nubilalis* Hb., by E. Roubaud (pp. 1–40); The Infectious Diseases of *Pyrausta nubilalis* Hb., by S. Metalnikov and V. Chorine (pp. 41–69); A New Yeast Species, Isolated from Diseased Larvae of *Pyrausta nubilalis* Hb., by S. Metalnikov, T. Ellinger, and V. Chorine (pp. 70, 71); Experimental Researches on the Infection of *Pyrausta nubilalis* by Entomophytic Fungi, by S. Metalnikov and K. Toumanoff (pp. 72, 73) (E. S. R., 59, p. 459); On the Infection of *Pyrausta nubilalis* Hb. by *Aspergillus flavus* and *Spicaria farinosa*, by K. Toumanoff (pp. 74–76); On the Natural Equilibrium of *Pyrausta nubilalis* Hb., by A. Paillot (pp. 77–106); On the Generic Characters of the Genera Ceromasia and Lydella and on the Identity of *Lydella lepida* Stein and *Senilis meigen*, by E. Séguy (pp. 107, 108); Notes on the Central European Parasites of *Pyrausta nubilalis* Hb., by T. Ellinger and H. Sachtleben (pp. 109–134); Corn Borer Controlling Factors and Measures in Southern Germany, by W. Zwölfer (pp. 135–142); Observations on the Corn Borer in Spain, by A. Hase (pp. 143–147); Experiments concerning the Biology of *Pyrausta nubilalis* Hb., by A. Krogh (pp. 148–152); The Ability of Corn Plants to Absorb and Endure Different Poisonous Compounds: A Contribution to a Therapeutic Treatment, by F. Weis, J. Blom, and N. Nielsen (pp. 153–173); A Double Parasitic Infection of a Larva of *Pyrausta nubilalis* Hb. (pp. 174–178), and *Diplogaster brevicauda* n. sp., a Possible Nematode Parasite of the Larvae of *Pyrausta nubilalis* (pp. 179–183), both by A. Kotlán; Insect Parasites of the Corn Borer (*Pyrausta nubilalis* Hb.) in Hungary, by E. Dudich (pp. 184–190);

Bacillus thuringiensis Berl., a Bacterium Pathogenic to Corn Borer Larvae, by B. Husz (pp. 191–193); Observations on the Corn Borer in Roumania, by W. K. Knechtel and M. Ionescu (pp. 194–200); Observations on the Corn Borer in Jugoslavia, by B. Hergula and V. Vouk (pp. 201–222); and Report on Preliminary Corn Borer Investigations in the Union of Socialistic Soviet Republics, by T. Ellinger (pp. 223–237).

New experiments in combating the European corn borer [trans. title], A. Németh (*Fortschr. Landw., 3 (1928), No. 11, pp. 493–499; abs. in Rev. Appl. Ent., 16 (1928), Ser. A, No. 11, pp. 579, 580*).—In this account of work in Czechoslovakia it is reported that in severe cases 40 to 50 per cent of the crop may be lost. Infestation of the stem is said to produce a forced ripening of the cob, and in observations in Czechoslovakia 95 per cent of the cobs that ripened 10 to 14 days before the normal date were found to be from infested plants. The cutting off and removal of the male panicles and the topmost leaf or two leaves and their use as green fodder is recommended. It is pointed out that at the flowering time of an early ripening variety of corn from 50 to 70 per cent of the larvae are either in the two top joints of the stem or at the foot of the two top leaf sheaths or even in the male panicle.

Notes on Plodia interpunctella (Indian meal moth), G. F. Hill (*Jour. Council Sci. and Indus. Research* [*Aust.*], *1 (1928), No. 6, pp. 330–340*).—Studies of the biology of the Indian-meal moth are included in this account.

Parasitic diseases of the larva of the Mediterranean flour moth and experiments on their application as biological means of control [trans. title], O. Mattes (*Sitzber. Gesell. Beförd. Gesam. Naturw. Marburg, 62 (1927), No. 12, pp. 381–417, pl. 1, figs. 7; abs. in Rev. Appl. Ent., 16 (1928), Ser. A, No. 8, p. 374*).—The author finds that the larva of the Mediterranean flour moth can be readily infected by mouth with the "sleeping disease" organism *Bacillus thuringiensis*, which multiplies internally and causes death. If the larva be protected by webs, it is not infected by dusting with flour containing the spores, and this protection also applies to other species, such as *B. agilis* n. sp., which is pathogenic under favorable conditions. Descriptions are given of two additional forms isolated from the larva, *Micrococcus ephestiae* n. sp. and *Thelohania ephestiae* n. sp.

A list is given of 63 references to the literature.

The South American boll-worm of cotton (Sacadodes pyralis Dyar), C. L. Withycombe (*Bul. Ent. Research, 17 (1927), No. 3, pp. 265–272, pls. 2*).—An account of the life history, habits, and means of control of a cotton bollworm, first reported upon by the author in 1925,[1] which occurs in Trinidad, Colombia, Venezuela, British Guiana, and Argentina.

The control of malaria and mosquito breeding at the Marine Barracks, Quantico, Va., during the year 1927, W. M. Garton (*U. S. Naval Med. Bul., 26 (1928), No. 3, pp. 747–754*).—In control work at Quantico in 1927, 33 per cent Paris green in an inert dust was found to be the most satisfactory strength under all wind conditions. One lb. of Paris green per acre was the proper amount, it being used at an approximate cost of 70 cts. per acre per season.

Notes on malaria transmission, C. Manalang (*Philippine Jour. Sci., 37 (1928), No. 1, pp. 123–131, pls. 4*).—The evidence presented is considered to show that *Anopheles minimus* is the natural vector of malaria in the Philippines.

Studies on anophelism without malaria in the vicinity of Amsterdam, A. de Buck, N. H. Swellengrebel, and E. Schoute (*Bul. Ent. Research, 17 (1927), No. 4, pp. 351–371, fig. 1*).—The data here presented have been substantially noted from another source (E. S. R., 60, p. 561).

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[1] Trop. Agr. [Trinidad], 2 (1925), No. 12, pp. 286, 287.

On the zoophily of Anopheles maculipennis in the Ukraine [trans. title], T. I. Iatzenko [F. I. Yatzenko] (*Bul. Soc. Path. Exot., 21 (1928), No. 4, pp. 322, 323; abs. in Rev. Appl. Ent., 16 (1928), Ser. B, No. 11, p. 212*).—It was observed in many places in the Ukraine in 1925 and 1926 that *A. maculipennis* showed a marked preference for domestic animals and some times hibernated in animal quarters sheltered from cold and drafts. No relation was found to exist between the number of maxillary teeth of *A. maculipennis* and its tendency to attack animals, or between the number of maxillary teeth and the size of the individual. The size of the mosquito was found, however, to be related to the length of the wings, the largest specimens occurring in the southern part of the Ukraine.

The vermillion spotted newt (Diemictylus viridescens rafinesque) as an agent in mosquito control, R. Matheson and E. H. Hinman (*Amer. Jour. Hyg., 9 (1929), No. 1, pp. 188–191*).—Experiments are reported which show the capacity of newts to destroy the mosquito larvae. A single newt destroyed 25 pupae in 40 minutes.

The bionomics of the lesser bulb flies, Eumerus strigatus Flyn., and Eumerus tuberculatus Rond., in south-west England, W. E. H. Hodson (*Bul. Ent. Research, 17 (1927), No. 4, pp. 373–384, pls. 2*).—An account of the life history and habits of two important bulb flies.

Dead Pollenia rudis (Fabr.) as hosts of dermestids, G. J. Spencer (*Canad. Ent., 60 (1928), No. 12, p. 283*).—Reports of serious infestations of dwelling houses in North Toronto, Ontario, by *Anthrenus muscorum* L. resulted in an investigation which led to the discovery that they were breeding in dead bodies of the cluster fly, occurring in attics. The breeding place of the carpet beetle, which was much less abundant, was not discovered.

The larvae of Agromyzinae [trans. title], J. C. H. de Meijere (*Tijdschr. Ent., 68 (1925), pp. 195–293, figs. 60; 69 (1926), No. 3–4, pp. 227–317, figs. 69; 71 (1928), No. 3, pp. 145–178, figs. 31*).—Descriptions are given of the larvae of leaf-mining Diptera of the subfamily Agromyzinae, their host plants, etc.

Investigations of the life history and control of the beet fly (Pegomyia hyoscyami Pz.) [trans. title], H. Blunck, H. Bremer, and O. Kaufmann (*Arb. Biol. Reichsanst. Land u. Forstw., 16 (1928), No. 3, pp. 423–573, pl. 1, figs. 33*).—Following a brief introduction, investigations are reported of studies of this pest in northern Hither Pomerania in the years 1924, 1925, and 1926, and in Silesia in 1925, 1926, and 1927. References to the literature are also given, together with a report upon the natural enemies of the beet fly (pp. 520–555), which latter includes a colored plate of eight species and a list of 55 references.

On the life-history and bionomics of the wheat bulb fly (Leptohylemyia coarctata Fall.), J. F. Gemmill (*Roy. Phys. Soc. [Edinb.], Proc., 21 (1926–27), No. 3, pp. 133–158, figs. 7*).—This account deals with the life history, distribution, entrance into and effect on the wheat plant, vitality under different conditions, other host plants of the larva, and preventive or remedial measures suggested. In appendixes, details are given relating to their life history, distribution, entrance into and effect on the young wheat plant, vitality under different conditions, experiments with other host or possible host plants of the larva, and other insect larvae affecting spring wheat.

Life histories of lady-beetle predators of the citrus aphid, R. L. Miller and W. L. Thompson (*Fla. Ent., 11 (1927), No. 1, pp. 1–8, figs. 8*).—In this continuation of the studies by Thompson previously noted (E. S. R., 57, p. 456), the authors deal with six additional species of ladybird beetles, namely, the blood-red ladybeetle (*Cycloneda sanguinea immaculata* Fab.), the convergent ladybeetle (*Hippodamia convergens* Guer.), two spotted ladybeetle (*Olla ab-*

dominalis sobrina Casey), *Exochomus marginipennis childreni* Muls., twice-stabbed ladybeetle, and Vedalia ladybeetle (*Rodolia cardinalis* Muls.).

The introduction of Cryptolaemus montrouzieri Muls. into Egypt, W. J. Hall (*Bul. Ent. Research, 17 (1927), No. 4, pp. 385–392, pls. 2*).—This is a report of biological studies of the Australian ladybird beetle (*C. montrouzieri*). Introduced into Egypt, this ladybird beetle has become an important enemy of the hibiscus mealybug (*Phenacoccus hirsutus* Green), accounts of which have been noted (E. S. R., 56, p. 460), but has failed to check the sugar-cane mealybug.

The species of Phyllotreta north of Mexico, F. H. Chittenden (*Ent. Amer., n. ser., 8 (1927), No. 1, pp. 1–62, pls. 2, figs. 2*).—This is a synopsis of the flea beetles of the genus Phyllotreta occurring north of Mexico in which 36 species are recognized, 17 species and numerous varieties being described as new. Tables are presented for their separation.

The Lepturini of America north of Mexico, Part I, J. M. Swaine and R. Hopping (*Canada Dept. Mines, Natl. Mus. Canada Bul. 52 (1928), pp. [3]+97, pls. 13*).—This is a report of the results of a study of the tribe Lepturini of the family Cerambycidae. A general introduction and a discussion of genotypes are followed by keys to and descriptions of the genera and species. The genera dealt with are Pseudopachyta n. g., Pidonia Muls., Idiopidonia n. g., Grammoptera Serv., Alosterna Muls., Pseudostrangalia n. g., Leptura L. (Strangalia Serv.), Typocerus Lec., Charisalia Csy., and Anoplodera Muls. A bibliography of 47 titles and an index are included.

Experiments in the control of the round-headed apple tree borer (Saperda candida Fab.) with calcium cyanide, C. E. Petch (*Sci. Agr., 8 (1928), No. 9, pp. 560–566, figs. 4*).—In control work with this pest in the Province of Quebec, it was killed by calcium cyanide without injury to the trees in 1926 and 1927. This insecticide does not become very active against the larvae until about the sixth hour after it has been applied, and action apparently ceases after 24 hours. Calcium cyanide mixed with castor oil into a paste gave the most satisfactory control against young borers, while shellac painted over the burrows of young borers gave almost negative results. From June 1 to 15 is considered the best time to apply calcium cyanide in that Province. In order to secure the best results against the old borers, it should be covered with dirt. The use of potassium cyanide at the rate of 0.5 oz. per tree is said to have killed the trees.

A borer pest of eucalypts: The destructive Phoracantha beetle and its control, F. G. C. Tooke (*Farming in So. Africa, 3 (1928), No. 33, pp. 1165, 1166, 1170, figs. 3*).—This is an account of *P. semipunctata*, one of the two principal pests of eucalyptus trees in South Africa, and means for its control.

Economic importance of wireworms and false wireworms in Saskatchewan, K. M. King (*Sci. Agr., 8 (1928), No. 11, pp. 693–706, figs. 2*).—In this preliminary report, based upon 5 years of study, 10 wireworm species taken from cultivated fields and 5 false wireworm species which have been encountered are listed and the more important ones briefly discussed. The prairie grain wireworm, which is outstanding at present, also appears to have the greatest potentialities for the future; it is independent of grass, although frequently abundant in sod. *Cryptohypnus nocturnus* (Esch.) is typically associated with grass. Other important species are *Limonius pectoralis* Lec., *Ludius virens* (Schr.), *Aeolus dorsalis* (Say), a species of Agriotini, and *Eleodes extricata convexicollis* Blais.

Wireworm injury to cultivated plants: A contribution to the study of Agriotes obscurus L. [trans. title], R. Regnier (*Rev. Path. Vég. et Ent. Agr.,* *15 (1928), No. 2, pp. 40–47, pls. 2, fig. 1)*.—A brief account of the biology, parasites, and means of control of wireworms, and particularly of *A. obscurus*.

The systematic status of the mint flea beetle (Chrysom., Coleop.), with additional notes, L. G. Gentner (*Canad. Ent., 60 (1928), No. 11, pp. 264–266*).—This paper deals with the systematic status of the mint flea beetle (*Longitarsus waterhousei* Kuts.), an account of which by the author has been noted from another source (E. S. R., 55, p. 357).

History of the distribution of the Mexican cotton boll weevil in Oklahoma, G. A. Bieberdorf (*Okla. Acad. Sci. Proc. [Okla. Univ.], 7 (1927), pp. 29–34, fig. 1*).—This account includes a chart showing the annual northern boundary lines of weevil infestation in Oklahoma from 1907.

New injurious Curculionidae (Col.), G. A. K. Marshall (*Bul. Ent. Research, 17 (1927), No. 3, pp. 199–218, pl. 1, figs. 2*).—Descriptions are given of 23 new curculionids, largely from southern Africa, and 2 from the Dutch East Indies and the Malay Peninsula. The genera Hondurus, Holorygma, Lophobaris, and Omobaris are erected.

The A B C and X Y Z of bee culture, A. I. and E. R. Root (*Medina, Ohio: A. I. Root Co., 1929, pp. [15]+815, figs. 693*).—This revised edition of the work previously noted (E. S. R., 49, p. 762) includes articles contributed by several specialists in beekeeping.

A survey of bee-culture in South Africa, A. E. Lundie (*Farming in So. Africa, 3 (1928), No. 33, pp. 1179–1181, figs. 4*).—This is a review of the progress of apiculture in South Africa in the past 18 years.

A handbook of beekeeping, I–VI, E. Zander (*Handbuch der Bienenkunde in Einzeldarstellungen. Stuttgart: Eugen Ulmer, 2. ed., rev., 1919, vol. 1, pp. 69, pls. 8, figs. 11; 1921, vol. 2, pp. [4]+60, pls. 12, figs. 14; 1922, vol. 3, pp. IV+232, figs. 225; [1921], vol. 4, pp. VII+195, figs. 138; 1920, vol. 5, pp. VIII+221, figs. 176; 1927, vol. 6, pp. VIII+143, figs. 14*).—This includes a new edition of volumes 1, 2, 3, and 4 of the work previously noted (E. S. R., 29, p. 57). The fifth volume deals with the practice of beekeeping, and the sixth, by Zander and A. Koch, with honey.

Possibilities in breeding, E. F. Phillips (*Gleanings Bee Cult., 56 (1928), No. 12, pp. 768–772, figs. 3*).—This is a discussion of the possibilities for bee breeding resulting from the perfection of a method of artificial insemination of queens by Watson, accounts of which have been noted (E. S. R., 60, p. 252).

The salivary glands of the honeybee and of bees in general, E. Bugnion (*Les Glandes Salivaires de l'Abeille et des Apiaires en Général. Montfavet (Vaucluse): Libr. de Vulgarisation Apicole, 1928, pp. 64, pl. 1, figs. 30*).—Following a résumé of the literature, the author reports upon his anatomical and physiological study of the salivary glands of bees. A list of 63 references to the literature is included.

On the transmission of spores of Bacillus larvae White by caterpillars of Galleria mellonella L. [trans. title], J. Suire (*Bul. Soc. Zool. France, 53 (1928), No. 5, pp. 319–321*).—The author's observations have led to the conclusion that the transmission of American foulbrood by bee moth larvae as reported by Vincens in 1924 (E. S. R., 52, p. 758) is accidental, and that there is sufficient reason for considering this method of little practical importance.

Sterilizing diseased combs, J. I. Hambleton (*Gleanings Bee Cult., 56 (1928), No. 12, pp. 781–783*).—This is a discussion of the merits of methods of sterilizing American foulbrood combs, particularly such as relate to the use of formaldehyde gas.

A reliable study of Kelty's method for differential diagnosis of brood diseases, R. Hutson and E. G. Carr (*Amer. Bee Jour., 68 (1928), No. 9, p.*

472).—The author found in tests conducted that the Kelty method was 100 per cent efficient in the differential diagnosis of American foulbrood.

The cause and cure for fermented honey, F. W. Fabian (*Sci. Agr.*, *9* (*1928*), *No. 3*, *pp. 144–146*).—This is a contribution from the Michigan Experiment Station, data relating to which have been noted from other sources (E. S. R., 60, pp. 12, 66).

The habits of Alysia manducator (Hym., Braconidae), J. G. Myers (*Bul. Ent. Research*, *17* (*1927*), *No. 3*, *pp. 219–229*).—A report on the bionomics of a braconid reared as a parasite of Australasian sheep maggots. The account supplements the papers of Graham-Smith (E. S. R., 42, p. 361) and Altson and Lefroy (E. S. R., 45, p. 458).

Two new scelionid parasites of Locusta migratoria L. from Russia, A. A. Ogloblin (*Bul. Ent. Research*, *17* (*1927*), *No. 4*, *pp. 393–404*, *figs. 7*).—A description is given of two new species of Scelio reared from eggs of *L. migratoria*, one in Poltava Province and the other in Turkestan.

Parasites of the carnation leaf roller Tortrix pronubana Hb. [trans. title], R. Poutiers (*Rev. Path. Vég. et Ent. Agr.*, *14* (*1927*), *No. 3*, *pp. 224–227*).—Notes are presented on six species reared by the author from *T. pronubana* in the vicinity of Antibes and Menton since 1923.

Methods for collecting parasites of earwigs, W. M. Davies (*Bul. Ent. Research*, *17* (*1927*), *No. 4*, *pp. 347–350*, *pl. 1*, *fig. 1*).—This is a contribution from the Rothamsted Experimental Station on methods.

On two new parasites from West Africa bred from the cacao barksapper (Sahlbergella), D. S. Wilkinson (*Bul. Ent. Research*, *17* (*1927*), *No. 3*, *pp 309–311*, *figs. 2*).—The braconid *Euphorus sahlbergellae* reared from the capsid bug *Sahlbergella singularis* Hagl., a serious pest of cacao trees in the Gold Coast, and the ichneumonid *Mesochorus melanothorax*, probably parasitic on *E. sahlbergellae*, are described as new.

Biological studies of two hymenopterous parasites of aquatic insect eggs, C. H. Martin (*Ent. Amer.*, *n. ser.*, *8* (*1927*), *No. 3*, *pp. 105–156*, *pls. 3*).—This is an account of studies of the life history and bionomics of *Trichogramma minutum* Riley and *Tiphodytes gerriphagus* (Marchal) in Michigan. A list of 63 of the more than 150 known hosts of *T. minutum* representing 7 orders, based largely on that given in the paper of A. A. Girault,[4] is included. Four of the species, namely, *Sialis infumata* Newm., *Chrysops caecitans* Walk., *C. striatus* O. S., and *Tabanus lasiophthalmus* Macq., are recorded as hosts for the first time.

The parasites of Dendrolimus pini L. and Lymantria monacha L. [trans. title], L. Sitowski (*Rocz. Nauk Rolnicz. i Leśnych* (*Polish Agr. and Forest. Ann.*), *19* (*1928*), *No. 1*, *pp. 1–12*; *Ger. abs.*, *pp. 10–12*; *abs. in Rev. Appl. Ent.*, *16* (*1928*), *Ser. A*, *No. 5*, *pp. 236*, *237*).—The anthomyiid *Muscina pabulorum* is said to have been the chief parasite of *D. pini* in forests along the banks of the Vistula in Poland, where it and *L. monacha* have been causing considerable damage. About 60 per cent of the larvae of *D. pini* are parasitized by it. *M. stabulans* Fall. and the stable fly are next in importance, the latter being recorded for the first time as a parasite of this host. *Sarcophaga* (*Agria*) *affinis* Fall. is an important parasite of both pests, parasitism by it amounting to from 10 to 15 per cent and from 30 to 40 per cent, respectively, in these hosts. It also parasitized the satin moth and the gipsy moth. Reference is also made to the attack of other parasites.

Preliminary note upon the discovery of parasites on the eggs of Diatraea saccharalis in Tucumán [trans. title], H. E. Box (*Rev. Indus. y Agr.*

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[4] Bul. Wis. Nat. Hist. Soc., n. ser., 9 (1911), No. 4, pp. 135–165.

Tucumán, 18 (1927), No. 1–2, pp. 5–8, figs. 2; trans. in Planter and Sugar Manfr., 80 (1928), No. 19, p. 363).—The author reports that the egg parasite *Trichogramma minutum* Riley and a proctotrupoid, *Profanurus* sp., attack the eggs of the sugar-cane borer (*D. saccharalis bolitorellus* Zell.) in Tucumán, Argentina. In some sections the destruction of eggs by these parasites was as high as 80 per cent, but the general average of such parasitism for all localities from which samples have been collected would appear to be around 50 per cent, showing the conditions to be quite similar in this respect to those in tropical cane-growing countries in the West Indies and northern South America.

Parasites of Perrisia pyri Bouché (Dipt., Cecidom.) [trans. title], C. Ferrière (*Bul. Ent. Research, 17 (1927), No. 4, pp. 421, 422*).—This is an annotated list of 10 species collected by J. G. Myers in Versailles, France, in the summer of 1925 as parasites of *P. pyri*, the pear leaf-curling midge. Only three, *Inostemma boscii* (Jur.), *Misocyclops marchali* Kieff., and *Torymus abbreviatus* Boh., were of economic importance.

[Studies of the hourglass or black widow spider (Latrodectus mactans)], E. Troise (*Compt. Rend. Soc. Biol. [Paris], 99 (1928), No. 31, pp. 1431–1434*).—Two contributions are here presented, (1) The Pharmacodynamic Action of the Venom of *Latrodectus mactans* (pp. 1431–1433), and (2) Serum Active against the Venom of the Spider *Latrodectus mactans* (pp. 1433, 1434).

A local outbreak of the winter or moose tick, Dermacentor albipictus Pack. (Ixodoidea) in Saskatchewan, A. E. Cameron and J. S. Fulton (*Bul. Ent. Research, 17 (1927), No. 3, pp. 249–257, figs. 8*).—An account of a common parasite of moose, elk, and deer in the forests of northern Saskatchewan, where it may attack and cause serious losses among cattle and horses permitted to graze in the haunts frequented by its native hosts. It is pointed out that deaths among the moose are frequently attributed to its ravages.

A new recurrent fever spirochete pathogenic for the guinea pig, Spirochaeta sogdianum, transmitted by Ornithodorus papillipes [trans. title], C. Nicolle and C. Anderson (*Compt. Rend. Acad. Sci. [Paris], 187 (1928), No. 18, pp. 746–748*).—This is a brief account of experimental studies with the white rat, guinea pig, and Macacus monkey in which a new spirochete, to which the name *S. sogdianum* is given, was found to be transmitted by the tick *O. papillipes*.

A new recurrent fever spirochete pathogenic for the guinea pig, Spirochaeta sogdianum, transmitted by Ornithodorus papillipes [trans. title], C. Nicolle and C. Anderson (*Arch. Inst. Pasteur Tunis, 17 (1928), No. 4, pp. 295–309, figs. 2*).—This is a more detailed account of the investigations noted above.

The Myriopoda of South Africa, C. Attems (*Ann. So. African Mus., 26 (1928), pp. VII+431, pls. 26, figs. 84*).—This is a monograph of the Myriopoda of South Africa. Part 1 (pp. 1–21) deals with faunistic remarks and part 2 (pp. 21–419) with taxonomy. Part 3 (pp. 419–431) consists of a 3-page list of the literature and an index to the genera and species, a number of which are described as new. Keys to the genera and species are included in the systematic section.

ANIMAL PRODUCTION

Growth, W. J. Robbins, S. Brody, A. G. Hogan, C. M. Jackson, and C. W. Greene (*New Haven: Yale Univ. Press; London: Humphrey Milford, Oxford Univ. Press, 1928, XIII+189, pl. 1, figs. 83*).—This treatise is a compilation of a series of popular lectures delivered under the auspices of the Missouri Chapter of Sigma Xi, and designed to give a comprehensive conception of growth. The first chapter deals primarily with the nature of growth. The statistical, nutritional, and morphological aspects of growth are discussed in the following three chapters, and the final chapter deals with the physiological regulation of growth. Appended is a bibliography for each section of the treatise.

The influence of the degree of fattening on the feed consumption per kilogram of growth [trans. title], S. LARSSON (*Meddel. Centralanst. Försoksv. Jordbruksområdet* [*Sweden*], *No. 338* (*1928*), *pp. 26*, *figs. 3*; *Eng. abs.*, *pp. 24–26*).—The material used as the source of data for this study was obtained with pigs from the Åstorp Experiment Station and from Danish experiment stations.

Of the characters recorded the thickness of back fat was found to be the best measure of the degree of fattening and also a good indicator of bacon quality. There was a negative correlation between the degree of fattening and length of body of pigs slaughtered at the same weight. Between thickness of back fat and thickness of belly there was a weak positive correlation. The coefficient −0.35±0.07 shows a negative correlation between thickness of back fat and weight of head and legs. An increase of 1 cm. in thickness of back fat was accompanied by an average decrease of 0.3 kg. in the weight of head and legs. These results led to the conclusion that the larger pigs make the best bacon hogs, since at the usual slaughtering weight of 90 kg. (about 200 lbs.) they have not put on as much fat as the smaller hogs.

Further studies showed that in the different weight classes the animals with less fat consumed somewhat less feed per kilogram of growth than animals in higher condition. The thickness of belly was found to exert more influence on the weight lost at slaughtering of gilts than on similar loss for barrows. An increase in the thickness of back fat and belly was accompanied by a decrease in loss at slaughtering, and thickness of back fat exerted its greatest influence in this respect upon the lighter weight animals.

Experiments in pork production for 1927 at the Åstorp Experiment Station [trans. title], N. HANSSON and S. BENGTSSON (*Meddel. Centralanst. Försöksv. Jordbruksområdet* [*Sweden*], *No. 339* (*1928*), *pp. 53*, *fig. 1*; *Eng. abs.*, *pp. 51–53*).—The results reported in this publication are based on 54 experimental groups made up of 209 individuals slaughtered during the year. Data were obtained on the breeding, feeding, slaughter, and grading of the animals, and the results were compared with those obtained in other years (E. S. R., 54, p. 466) as to the suitability of the Swedish farm breed and the Yorkshire breed as bacon producers.

During 1927 the farm breed made the fastest gains and consumed less feed per kilogram of growth, but lost more weight at slaughtering than the Yorkshires. The farm breed yielded a smaller amount of bacon and graded lower in firmness of back fat and for development of hams and belly bacon, but graded higher in length of body and thickness and distribution of back fat. Of the farm breed pigs, 67 per cent were graded in class 1 for export bacon, while only 52 per cent of the Yorkshires were graded in this class. It has been found that by careful selection of breeding stock, especially in some strains, it has been possible to improve the quality of bacon, and also that the use of sires of desirable qualities is the quickest way of forming a uniform herd that will produce animals of good bacon type.

Records show that pigs which are well developed at 3 weeks of age grow faster, require less feed per unit of gain, and when slaughtered grade somewhat higher than pigs not so well developed at that age. However, the weight of the entire litter at 3 weeks of age can not be used as a criterion for the future development of the litter.

Relative energy value of alfalfa, clover, and timothy hay for the maintenance of sheep, H. H. Mitchell, W. G. Kammlade, and T. S. Hamilton (*Illinois Sta. Bul. 317 (1928), pp. 125–167, figs. 5*).—The first experiment reported in this publication is a more detailed account of work previously noted (E. S. R., 56, p. 367).

The second experiment reported is also a continuation of previous work (E. S. R., 60, p 257). From the data obtained the authors conclude that the metabolizable energy of timothy hay is more completely utilized in the maintenance of sheep than is the metabolizable energy of alfalfa hay. Since the metabolizable energy per unit of dry matter is approximately the same in both hays, these results indicate that the net energy value of timothy hay is considerably higher than that of alfalfa hay.

It was found that on a plane of undernutrition fat is withdrawn from the muscular and glandular tissues before the marrow fat is affected. Due to the withdrawal of fat. the ratio of protein to moisture in the body was increased. Undernutrition did not materially affect the composition or chemical growth of wool.

Recent work on the digestibility of English cereals, E. T. Halnan (*Harper Adams Util. Poultry Jour., 13 (1927–28), No. 10, pp. 468–470*).—A study of five varieties of English wheats by the poultry nutrition section of the University of Cambridge, England, showed but little variation in their digestibility. Three varieties of oats showed a rather wide range of digestibility, and these variations were closely associated with fiber content. The results show that poultry do not digest fiber to any considerable extent, and that fiber should not be considered a source for them of food nutrients.

The influence of confinement on the production of White Leghorn pullets, F. C. Bobby (*Harper Adams Util. Poultry Jour., 13 (1927–28), No. 10, pp. 471–477, figs. 3*).—In this study at the Harper Adams Agricultural College, England, 3 lots of 40 Leghorn pullets were observed for a period of 40 weeks beginning September 20. During October all birds had access to grass runs, and 1 lot, used as a check, was allowed access to the run throughout the test. On October 30, 1 lot was confined in a house with a board front and ordinary glass in the windows, while another lot was confined in a house with a wire netting open front. The latter lot was allowed to go out into the grass runs again on March 15. The other lot was divided into 2 groups at this date, and 1 group was fed 2 per cent of cod-liver oil. Neither of the divided groups was allowed outdoors. The feeding with the above exception was the same in all lots.

The birds in the check lot laid more eggs than any of the other lots, the advantage being gained during the winter months. Production in the lot confined in the open front house rose markedly when the birds were allowed outdoors. The difference in the production of the above lots during February and March is statistically significant. Production in the lot confined in the glass front house was quite low. These results confirmed those previously noted (E. S. R., 58, p. 168).

After cod-liver oil was added to the ration of one of the confined groups, production rose to a level closely approximating that of the lots in the grass runs. No signs of nutritional disturbance were apparent in any of the lots until February, and then birds in the glass front house began to show signs of leg weakness. Some of these birds were treated with ultra-violet light and recovered in 10 days, while others dosed with cod-liver oil recovered in 8 days. In all, 18 birds were treated for leg weakness. The thyroid glands of the birds confined during the winter were found to be enlarged, and there was also a loss of body weight. There was no significant difference in the mean egg weight of any of the lots.

Abnormal embryos in relation to mortality during incubation, F. B. Hutt (*Harper Adams Util. Poultry Jour., 13 (1927–28), No. 11, pp. 547–549*).—More than 12,000 unhatched eggs from three commercial flocks and from the flock of the animal breeding research department, University of Edinburgh, Scotland, were examined in this study. Of the fully formed dead chicks over 55 per cent of the deaths were due to malposition of the embryo. The intensity of chondrodystrophy varied with the source of the eggs and with the season of the year. Deaths from this cause varied from 1 to 8 per cent of the embryos. Monstrosities were responsible for slightly less than 4 per cent of the dead embryos examined.

Rabbit growth studies under commercial conditions, W. K. Wilson (*Harper Adams Util. Poultry Jour., 13 (1927–28), No. 11, pp. 581–588, figs. 6*).—Data on the growth of 3 groups of rabbits, consisting of White Angora, Havana, and various other breeds, as ascertained at the Harper Adams Agricultural College, England, are reported. The young were weighed as litters as soon as it was deemed safe to handle them, but after they had received identification marks they were weighed individually. The weighings were made twice a week for approximately 1 year.

It was found that growth was comparatively slow until a short time after the young left the nest. From then to about 4.5 to 5 months of age, growth was rather rapid, after which increases in body weight occurred at a slower rate. Local conditions such as food and weather influenced greatly the irregularities in the growth curves. Insufficient material was obtained to show any significant differences in the growth rate of the sexes.

The standard of perfection for American domestic rabbits, M. W. Meek (*Los Angeles: Amer. Rabbit Assoc., 1928, pp. 174, figs. 60*).—The origin, history, and description of the recognized varieties of domestic rabbits, with the present American and foreign standards, are presented in this treatise.

DAIRY FARMING—DAIRYING

[Report of proceedings of the World's Dairy Congress, 1928] (*London: World's Dairy Congress Com., 1928, pp. VII+896, figs. 63*).—Executive material and other miscellaneous information, together with the following papers in addition to those noted elsewhere, which were presented at the various sections of the Congress held June 26 to July 12, 1928, at London, Reading, and the Royal Show, Nottingham, England, and in Scotland, are included in this report.

Milk production.—Limiting Factors in the Feedings and Management of Milch Cows, by R. B. Boutflour (pp. 15–18); The Feeding of Dairy Cows, by J. Mackintosh (pp. 19–25); The Protein Requirements of Dairy Cows, by S. Weiser (pp. 26–29); The Feeding of the Dairy Cow, by M. Eschweiler (pp. 29–41); Calcium and Phosphorus in the Metabolism of the Lactating Animal and Factors that Influence Their Assimilation, by J. B. Orr and H. E. Magee (pp. 42–44); Some of the Effects Produced in the Richness of Cows' Milk by Feeding Cod Liver Oil, by J. Golding (pp. 44–49); The Rational Use of Skimmed Milk in the Feeding of Calves, by E. Van Godtsenhoven (pp. 54–59); The Importance of Salt in the Feeding of Dairy Cows, by E. Marre (pp. 59–69); Milk Recording, by H. Jackson (pp. 69–71); Milk Control in Belgium, by M. J. de Tilloux and M. G. Verpoorten (pp. 71–79); Milk Control Associations and Stud Book Keeping in Hungary, by O. Wellmann (pp. 79–83); Production of Hygienic Vitaminized Milk (Ultra-Lakta), Prague, Czecho-Slovakia, by V. Bronsky (pp. 88–90); The Dairymen's League and Its Milk Pool in the U. S. A., by J. D. Miller (pp.

90–97); Education and Advisory Work amongst Milk Producers, and the Handling of Milk at the Farm, by S. Williams (pp. 302–309); Dairy Education in Hungary, by O. Gratz (pp. 310–312); The Instruction of the Dairy Staff, by F. Zaribnicky (pp. 312–314); Relationship between the Milk Producer and the Milk Dealer, by C. King (pp. 314–322); Purchasing Milk on a Quality Basis, by E. White (pp. 323–328); The Rôle of the Association of Milk Producers, and Their Methods, by M. Mesureur (pp. 335–342); The Standardisation of the Quality of Dairy Products, by R. M. Veeman (pp. 342–344); Indian Dairying, by W. Smith (pp. 344–352); and Lord Lister as a Pioneer of Clean Milk Production, by Gorini (p. 355).

Milk distribution and manufacture.—Scientific Work in the Sphere of Scheming, Building, and Arranging of Dairies, by B. Lichtenberger (pp. 100–107); A New Investigation Concerning the Low Temperature Pasteurisation of Milk and a Re-action for Controlling the Pasteurising Temperature, by S. Orla-Jensen (pp. 107–127); The Safety Factor of Pasteurised Milk, by H. C. C. Mann (pp. 127–133); Studies in the Holding Method of Pasteurisation, by G. D. Torre (pp. 134, 135); On the Pasteurisation of Milk in the Production of Some Types of Italian Cheese, by G. Fascetti (pp. 135, 136); Metals and Their Various Influences on Milk, by O. F. Hunziker (pp. 136–151); Guarantees as to Purity, Genuineness, and Composition of the Dutch Milk and Milk Products, by A. J. Swaving (pp. 157–177); Hungarian Government Regulations for the Milk Industry, by P. Tolnay (pp. 177–180); Connection of the Activities of Administrative and Judicial Authorities in the Production, Treatment, and Utilisation of Milk, by Devich (pp. 180–184); Some Factors Influencing Viscosity in Cream, by G. T. Pyne and J. Lyons (pp. 184–188); Dry Milks, by H. E. Van Norman (pp. 364–370); Some of the Physical and Chemical Properties of Powdered Milk, by A. Miyawaki (pp. 370–376); Development of the Ice Cream Industry in the United States, by F. Rasmussen (pp. 382–391); Newer Phases of Processing Ice Cream, by G. D. Turnbow (pp. 391–407); The Manufacture of Ice Cream in Belgium, by A. Mertens (pp. 407–409); Retail Distribution of Milk in Large Cities, by E. A. Evans (pp. 409–418); The Transport and Distribution of Milk in India, by N. N. Bhose (pp. 419–423); The Importance of Yoghourt for the Tropics, by O. Laxa (pp. 423, 424); Methods of Grading Butter as Practised in Various Countries, and Their Influence on Manufacture, by G. S. Thomson (pp. 424–432); Australian Methods of Manufacture and Grading of Butter for Export, by F. Wigan (pp. 432–436); Butter Control in Belgium, by J. Brabant (pp. 436–441); Canadian Cheese in the World's Market, by J. A. Ruddick (pp. 449–455); The Lipolysis of Worked Butter, Several Days after Preparation, by O. Gratz (pp. 456–460); Activated Milk, by Hoffman (pp. 460–462); and On the Microbial Flora of Belpaese, by G. D. Torre (pp. 462, 463).

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Dairy chemical technique.—Natural Variation in the Composition of Milk, and the Difficulties Encountered in Distinguishing between Abnormal and Adulterated Milk, by H. T. Cranfield (pp. 720–723); The Freezing Point of Milk, by J. D. Filippo (pp. 723–725); The Freezing Point of Milk as a Means of Detecting Added Water, by J. H. Buchanan and O. E. Lowman (pp. 725–733); The Value of the Refractometer in Milk Analysis, by G. D. Elsdon and J. R. Stubbs (pp. 740–743); Appreciation of the Refractometer Test, by J. Hanley (pp. 744–767); and The Ash and Non-Fatty Solids Content, the Specific Gravity, and the Determination of the Refractive Index of the Calcium Chloride Serum in Individual Samples of Milk, by L. Bém (pp. 767–770).

General.—Milk Consumption and the Growth of School Children, by J. B. Orr, G. Leighton, L. Mackenzie, and M. L. Clark (pp. 778–786); Milk Selling Agency, by A. E. Magee (pp. 793–797); Casein, by C. Porcher (pp. 800–810); The Discoloration of Commercial Casein, by O. Laxa (pp. 810, 811); The Dairy Shorthorn, by R. Hobbs (pp. 814–817); Kerry Cattle, by N. Zambra (pp. 820–826);

English Jersey Cattle, by R. W. Bell (pp. 828–832); The Red Poll, by D. Brown (pp. 832–834); and The Ayrshire Breed, by W. T. R. Houldsworth (pp. 834–837).

Forty-sixth report of the Dairymen's Association of the Province of Quebec, 1927 (*Dairymen's Assoc. Prov. Quebec Ann. Rpt., 46 (1927), pp. VIII+113, fig. 1*).—This is a report of the association and of the Dairy School of the Province of Quebec, Canada, and includes a number of papers on dairying, most of which are of popular interest.

Feeding cocoa meal to dairy heifers, H. B. Ellenberger and R. D. Aplin (*Vermont Sta. Bul. 284 (1928), pp. 19, figs. 6*).—Continuing the study with cocoa meal (E. S. R., 58, p. 770), 6 Holstein heifer calves were divided into 2 lots of 4 and 2 animals each when 2 weeks old. They were fed on whole milk at first and then gradually changed to skim milk. During the first three months they were fed all the grain they would consume. Mixed hay, corn silage, and a mineral mixture were fed throughout the test after the calves were weaned. A grain mixture containing 15 per cent cocoa meal was fed to the lot of 4 calves, while a ration of similar nature but without the cocoa meal was fed to the other group. The animals were fed until they were 2.5 years old, and were bred when 19 to 20 months of age. During the summer they were on pasture and during the winter in barns and open yards. Weights and measurements were made monthly of each animal.

During the first 3 months the calves receiving cocoa meal had a tendency to scour. This ration was also rather unpalatable and less of it was eaten. These two factors caused the calves so fed to gain less than the other lot. The difference in palatability was noticeable throughout the test, although after the first 3 months the animals consumed their allowance of feed, and after the initial difference in growth and physical condition both lots were about the same. Two heifers receiving cocoa meal aborted their calves, but this could not be wholly attributed to the feed. After freshening, the heifers fed cocoa meal would not consume all of their grain allowance and two developed abscesses on their legs. When changed to a standard grain ration, the milk flow of the heifers fed cocoa meal was increased but the butterfat content was not affected.

From the results obtained the use of cocoa meal for dairy calves and heifers is not recommended.

Chemical sterilization of milk bottles in relation to tubercle bacilli, E. M. Wade, R. W. Archibald, and H. A. Whittaker (*Jour. Bact., 15 (1928), No. 3, pp. 189–194*).—In an effort to determine the most effective chemical for sterilizing milk bottles exposed to contamination with tubercle bacilli at various institutions, the State Board of Health of Minnesota conducted a series of three experiments, using guinea pigs as laboratory animals. In each series a fresh sputum specimen was obtained from a positive case and rendered homogenous by shaking in an agitating machine. The specimens were treated with different chemicals for varying intervals, and the guinea pigs inoculated with the material and later examined for tubercular lesions.

It was found that calcium hypochlorite in the usual dilutions and even up to 500 parts per million available chlorine was not dependable as a sterilizing agent for human tubercle bacilli. Chloramine in dilutions of from 93 to 95 parts per million available chlorine used for 3 minutes was effective in destroying the bacilli, and stronger solutions used for shorter periods were also effective.

Butterfat tests, W. F. Jensen (*N. Y. Prod. Rev. and Amer. Creamery, 66 (1928), No. 25, p. 1282*).—A comparison of the results of several recognized methods for butterfat determinations of 20 samples of buttermilk showed that when tested by the official Roese-Gottlieb method the average percentage of fat for all samples was 0.81. The American Association test gave an average of 0.83 per cent fat; the Babcock test, using the skim milk bottle, 0.47 per cent; and a modified Babcock test 0.6 per cent.

The modified Babcock test, as suggested by J. C. Brown, is made with the skim milk bottle, using 9 gm. of buttermilk to which is added 13 gm. of sulfuric acid. The mixture is revolved in the centrifugal tester for 15 minutes at not less than 1,100 revolutions per minute. Sufficient hot water to fill the bottle to the neck is added and then revolved for 5 minutes. More hot water is added to bring the fat column up into the neck of the bottle and revolved for 1 minute. The fat column is then clear and ready to read.

A thermophile coagulating milk under practical conditions, R. V. Hussong and B. W. Hammer (*Jour. Bact., 15 (1928), No. 3, pp. 179–188*).—Samples of skim milk intended for drying were obtained by the Iowa Experiment Station from a commercial plant. The milk had been pasteurized at from 71 to 77° C. and held while hot in a wooden vat for periods up to 24 hours. The milk at this plant curdled occasionally while still hot. From these samples was isolated a strict thermophile which coagulated milk rapidly at 71°. The organism produced lactic acid of the *d* type, while the formation of volatile acid was very low. The soluble nitrogen in milk in which the organism grew was only slightly increased. Since it is believed to be an undescribed species, the name *Bacillus calidolactis* is proposed for it, and descriptions of its morphology, cultural characteristics, and biochemical features are given.

A strain of Clostridium welchii causing abnormal gassy fermentations in Emmenthal or Swiss cheese, W. R. Albus (*Jour. Bact., 15 (1928), No. 3, pp. 203–206*).—From a Swiss cheese which showed abnormal gassy fermentation a nonpathogenic strain of *C. welchii* was isolated at the U. S. D. A. Bureau of Dairy Industry. A large number of cheeses have been made from milk inoculated with this organism and both "niszler" and "pressler" types of gassy fermentation produced. On the other hand, it was shown that some factor or group of factors other than the presence of this organism plays an important part in the occurrence in the cooked cheeses of gassy fermentation.

The cheese industry, II, M. Beau and C. Bourgain (*L'Industrie Fromagère. Paris: J.-B. Baillière & Sons, 1927, pp. 216, figs. 68*).—In this second treatise dealing with the manufacture of cheese (E. S. R., 58, p. 69), the authors discuss the location of cheese factories as to availability and source of raw material. A general outline is given of the processes involved in cheese making, together with specific information relating to many kinds of cheeses.

No marked difference in dry skim for ice cream, W. E. Price and R. Whitaker (*Butter and Cheese Jour., 19 (1928), No. 37, p. 62*).—Dry skim milk made by the spray, vacuum roll, and open roll processes was made into ice cream of various compositions in studies at the New York Cornell Experiment Station. Determinations were made of the influence of these types of dry skim milk on the properties of the mix, freezing characteristics, and quality for approximately 100 batches of ice cream made with the regular equipment.

It was found that the titrable acidity was higher in mixes made with open roll dry skim milk than with either of the other types, in which it was the same. The pH value was the same in all cases. The basic viscosity was greatly increased in mixes made with the open roll type. The most soluble types of dry skim milk developed swell most rapidly, but the less soluble types developed practically the same swell if whipped sufficiently long. Any off flavors in the dry skim milk were apparent in the resulting ice cream, and the open roll type developed a characteristic flavor which could be partially offset by using large amounts of fat in the mix. The most insoluble types of dry skim milk produced the smoothest texture ice cream. Differences in the body or in deterioration in quality during storage that could be attributed to the different types were not detected The open roll type of dry skim milk gave a slightly yellowish tint to the ice cream.

A modified method of applying the Dahlberg test, M. E. Parker (*Ice Cream Rev. 11 (1928), No. 12, p. 71*).—The author describes a modification of the method of testing gelatin for determining the quantity required for ice cream mixes, sherbets, and water ices as previously described (E. S. R., 53, p. 475).

VETERINARY MEDICINE

Hematological studies of some diseases of cattle, swine, and goats [trans. title], J. Rudolf (*Deut. Tierärztl. Wchnschr., 36 (1928), No. 26, pp. 445–451*).—The diseases in which blood studies were made, the details of which are presented in tabular form, are bovine tuberculosis, parturient paresis, influenza, foot-and-mouth disease, catarrhal fever, gastrointestinal intoxication, endometritis, swine plague, swine erysipelas, swine paratyphoid, osteomalacia of the goat, enzootic shote pneumonia, rickets, lungworm pneumonia, etc. A list is given of 20 references to the literature.

[Contributions on economic parasites] (*Jour. Parasitol., 15 (1928), No. 2, pp. 135–149*).—Abstracts are given of papers presented at the fourth annual meeting of the American Society of Parasitologists held at New York City, December 27–31, 1928, among which are the following: Effect of Helminthiasis on Resistance of Chickens to Parasitism, by J. E. Ackert and R. W. Jones (p 135); Changes in the Acid-Base Equilibrium of the Blood of Rats Infected with *Trypanosoma equiperdum*, by J. Andrews (p. 135); Observations on the Life History of the Swine Stomach Worm, *Physocephalus sexalatus*, in the United States, by E. B. Cram (p. 136); and Observations on the Life History of *Stephanurus dentatus*, by B. Schwartz and E. W. Price (pp. 145, 146).

The action of phenol and formol on aerobic and anaerobic organisms, J. P. Scott (*Jour. Infect. Diseases, 43 (1928), No. 1, pp. 90–92*).—In this contribution from the Kansas Experiment Station it is shown that phenol in strengths up to 5 per cent acts very slowly on anaerobic organisms, while formaldehyde in dilutions of 0.5 to 0 75 per cent sterilizes anaerobic cultures rapidly. The greater susceptibility of aerobic spore-forming organisms to these disinfectants makes it possible to eliminate aerobic contaminations from anaerobic cultures by the use of 0.5 per cent phenol or formol.

Venoms of North American snakes and their relationship, T. S. Githens and L. W. Butz (*Jour. Immunol., 16 (1929), No. 1, pp. 71–80*).—In studies of the venom of six species of North American rattlesnakes, they were found to contain identical or almost identical toxic principles. The toxic principles of the copperhead and moccasin are identical or almost so, but differ to some extent from those of the rattlesnakes.

Some causes of variation in the laboratory interpretation of complement fixation by different methods, M. A. Wilson, M. V. Forbes, R. M. Nedley, and F. Honig (*Jour. Immunol., 15 (1928), No. 6, pp. 507–519*).—The findings of the studies here presented are considered to indicate the desirability of standardizing the diagnostic nomenclature so that a four-plus diagnosis will mean the same thing when reported by different laboratories.

Agglutination by precipitin, [I, II], F. S. Jones (*Jour. Expt. Med., 46 (1927), No. 2, pp. 303–314; 48 (1928), No. 2, pp. 183–192*).—The author has found that serum (antigen) when heated at a temperature sufficient to cause definite clouding reacts more intensely with a specific precipitin than a portion of the unheated serum or samples heated at lower temperatures. "The phenomenon is explained on the basis that coagulated protein in suspension is covered with undenatured antigen and the addition of precipitin causes agglutination of the coagulated protein. Similar phenomena are obtained when bacteria or collodion particles are mixed with diluted serum (antigen) and precipitin added; the particles or bacteria agglutinate and increase the visibility of the reaction.

"Further it is shown that collodion particles sensitized with cow serum or crystallized egg albumin and subsequently washed until the washing fluid no longer contains the antigenic substance will agglutinate when small quantities of specific precipitin are added. Bacteria sensitized with cow serum and subsequently washed until cow serum no longer remains in the washing solution agglutinate when cow antiserum at fairly low concentration is added. It was not possible to show that bacteria soaked in crystallized egg albumin and subsequently washed retained on their surfaces sufficient undenatured egg albumin to react to crystallized egg albumin precipitin."

In the second paper the author finds that collodion particles sensitized with various proteins adsorb sufficient protein to agglutinate in the presence of precipitin specific for the adsorbed protein. "The amount of adsorption, judged by agglutination, is not dependent on the concentration of the sensitizing protein beyond a certain maximum. The agglutination resulting from the addition of immune serum to particles sensitized with protein is immunologically specific. Particles exposed to a number of antigenic substances in succession are agglutinated by all of the appropriate antisera. Particles exposed to immune serum and subsequently washed fail to agglutinate in the presence of antigen although some of the protein constituents of the immune serum are fixed upon them and its antibody content diminishes."

Acid agglutination optimum in the Brucella group, E. E. Ecker and M. A. Simon (*Jour. Infect. Diseases, 44 (1929), No. 1, pp. 62–64*).—The authors report upon studies made of four strains of *B. melitensis* and *B. abortus* of different origins. Their acid agglutination optimums were found to be identical, a fact which is believed to be of interest in the consideration of their close relationship, if not their identity.

Behavior of Brucella melitensis and abortus toward gentian violet, I. F. Huddleson and E. Abell (*Jour. Infect. Diseases, 43 (1928), No. 1, pp. 81–89*).—The authors have found the varieties, and strains within a variety, of the genus Brucella to exhibit a difference in sensitiveness to gentian violet in a medium, expressed in degree of growth. "The growth of strains of the *B. melitensis* and *paramelitensis* variety is not inhibited on a medium by the presence of gentian violet in dilutions of 1:100,000 and 1:250,000. A few of the strains are slightly inhibited by the presence of a 1:50,000 dilution of the dye. Strains of the *B. abortus* variety may be divided into two groups as regards their ability to grow on a medium in which gentian violet is present, namely, those which are markedly inhibited and those which fail to grow in the presence of 1:50,000 and 1:100,000 dilution of the dye. The latter group contains one bovine strain, several human strains, and all porcine strains in the possession of the writers."

It is thought that the difference in dye sensitivity may prove to be a means of distinguishing strains of the *abortus* variety not otherwise distinguishable.

The respiration of the abortus-melitensis group, M. H. Soule (*Jour. Bact., 17 (1929), No. 1, pp. 59, 60*).—The author reports upon the respiratory quotients determined for human, porcine, and bovine cultures of *Brucella abortus* and for cultures of *B. melitensis*.

Comparative inoculations of Brucella abortus and B. melitensis in the goat [trans. title], E. Burnet (*Arch. Inst. Pasteur Tunis, 17 (1928), No. 2, pp. 108–137*).—Experimental inoculations of *B. abortus* and *B. melitensis* made with gestating and nongestating animals are reported upon. The goat was found to be susceptible to *B. abortus*, although less so than to *B. melitensis*, and abortion to result from the inoculation. It is concluded that *B. abortus* may be transmitted from the cow to the goat and from the goat to the cow, but the bovine type does not commonly cause undulant fever in man.

The pathogenicity of the species of the genus Brucella for monkeys, I. F. Huddleson (*Jour. Bact., 17 (1929), No. 1, pp. 58, 59*).—In the experiments conducted with strains of each of the three species of the genus Brucella administered by mouth, it was found that the porcine is the most pathogenic, and this is true regardless of the source of isolation, whether from hog, cow, or man. The true bovine abortus species regardless of its form will produce a mild type of the disease followed by rapid recovery after the ingestion of a massive dose or repeated small doses over a considerable period of time. Small doses of a recently isolated strain of the *melitensis* species will produce the disease in monkeys, but old cultures fed daily for a long period of time fail to produce the disease. In nearly every case one agar slant of the porcine species has produced the disease in 10 to 15 days without recovery.

The significance of Brucella abortus agglutinins in human sera, C. M. Carpenter, R. Boak, and O. D. Chapman (*Jour. Bact., 17 (1929), No. 1, p. 59*).—The authors report that in a study of 4,050 serum samples collected at Syracuse, N. Y., 7.3 per cent contained *B. abortus* agglutinins, while 2.4 per cent of 955 samples collected from Bellevue Hospital, New York City, were positive.

"The blood serum from individuals fed pasteurized milk with a high *B. abortus* agglutinin titer showed no evidence of the absorption of the antibodies. Examinations of the blood serum of individuals having recovered from undulant fever demonstrated the antibodies to be present in some cases for a period of 2 years after the symptoms had subsided. *B. abortus* has been isolated from the blood of patients with undulant fever showing no agglutinins as well as from cases with very few agglutinins in their serum. Because of such findings it is impossible to designate the minimum serum titer diagnostic of undulant fever."

The identification of Brucella abortus from human sources, J. T. Duncan (*Roy. Soc. Trop. Med. and Hyg. Trans., 22 (1928), No. 3, pp. 269–280, pl. 1*).—It is pointed out that while an increasing number of reports of undulant fever (Bang) in man in the United States and other countries may in some measure be due to the greater diligence with which the search for the disease is now being made and to greater accuracy in the diagnosis of obscure fevers, there can be no doubt that in some areas, particularly in Palestine and Rhodesia, they point clearly to a disease of very recent appearance which is tending to spread. The chief animal carrier in these new areas seems to be the milch cow, and the infecting organism a variety of *B. abortus*.

"Except in northern Italy, where the cattle may be infected with *B. melitensis*, there is nothing to suggest an extension from the endemic centers of the goat-borne disease, but rather the development of a new pathogenic type, differing somewhat from the normal bovine variety of *B. abortus* of northern countries (of which it may be a variant), but resembling closely the porcine variety. The apparent rôle of the milch cow as a disseminator of this new infection raises a question of great economic importance, and renders very necessary a more complete study of the organisms recovered from man in the new areas of the disease as well as a thorough investigation of the possible animal carriers."

A study of the intranuclear inclusions characteristic of Borna disease [trans. title], S. Nicolau and I. A. Galloway (*Compt. Rend. Soc. Biol.* [*Paris*], *99* (*1928*), *No. 32*, *pp. 1455–1457*).—Inoculation experiments with the rabbit, horse, and sheep here reported have led to the conclusion that the intranuclear inclusions of Joest and Degen (E. S. R., 23, p. 187; 26, p. 786) can exist in the cerebral tissue devoid of all virulence. In some particular cases the neurones are able to confine the inclusions in the process of resorption, and their tinctorial affinity may be completely modified.

Goiter in farm animals, H. Welch (*Montana Sta. Bul. 214* (*1928*), *pp. 26*, *fig. 1*).—This is a general account dealing with the subject under the headings of goiter distribution, goiter of the adult and of the new born, type of goiter, distribution in Montana, variation in occurrence, movements of breeding stock into and out of goiter districts, iodine content of the normal and the hyperplastic thyroid, cause of goiter, control of goiter in animals, and preparation and use of iodized salt. A list of 17 references to the literature is included.

On the occurrence of acid-fast bacteria in the feces and intestines of healthy as well as tuberculous cattle, H. Kroger (*Ueber das Vorkommen Säurefester Stäbchen im Kot und Darm Gesunder sowie Tuberkulöser Rinder. Inaug. Diss., Tierärztl. Hochsch., Hanover, 1926*, *pp. 43*).—Saprophytic bacteria were frequently found in the feces of both healthy and diseased cattle, but in none of the animals were tubercle or paratubercle bacilli detected in the feces. In none of the healthy cattle were acid-fast organisms of the tubercular or paratubercular type detected in smears from the intestinal mucous membrane, nor in histological sections. None were detected in the intestinal mucous membrane of bovines suffering from generalized organic or pulmonary tuberculosis. In two cases of intestinal tuberculosis with marked changes in the mucous membrane, tubercle bacilli were detected microscopically as well as histologically. A bibliography of six pages is included.

The prevalence and extent of bovine tuberculosis in Canada, A. E. Cameron (*Canad. Pub. Health Jour.*, *20* (*1929*), *No. 1*, *pp. 1–5*).—This is a report by the chief veterinary inspector, Health of Animals Branch, Canada Department of Agriculture.

The fate of human and bovine tubercle bacilli in various organs of the rabbit, M. B. Lurie (*Jour. Expt. Med.*, *48* (*1928*), *No. 2*, *pp. 155–182*, *figs. 6*).—The author finds that the original distribution of tubercle bacilli of both human and bovine types to the various organs of the rabbit after intravenous inoculation follows the distribution of particulate matter in the following order per gram of tissue: Spleen, liver, lung, bone marrow, and kidney. The relative position of the lung among these organs is less certain than that of the others.

"At first the tubercle bacilli both of the human and bovine types grow in all the organs without any effective opposition. The rate of growth of both types differs in the various organs. It is much faster in the spleen than in the liver. With small doses very little growth takes place in the liver and bone marrow, especially with the bovine type. The human type of tubercle bacillus grows faster in the several organs of the rabbit than the bovine type. This more rapid growth of the human type is followed by an earlier and more complete destruction of the human type than of the bovine.

"With both types destruction occurs first in the liver, spleen, and bone marrow. In the lung and kidney destruction of the human type takes place later, and unchecked multiplication of the bovine type continues in these organs until the death of the animal. With smaller doses of human bacilli destruction is brought about later in the liver, spleen, and bone marrow than with larger doses. With both types, in a given time, destruction is more complete in some organs after a large dose than after a small dose. The destruction in the various organs is rapid at first and progresses more slowly as time passes. So that even 6 months after intravenous injection of small doses of human tubercle bacilli they have not yet completely disappeared from the lung and spleen."

Tuberculosis in captive wild animals, A. S. GRIFFITH (*Jour. Hyg.* [*London*], *28* (*1928*), *No. 2, pp. 198–218*).—This is a report of the results of investigations of material derived from mammals, birds, and reptiles.

The pathogenicity of the avian tubercle bacillus, E. S. L'ESPERANCE (*Jour. Immunol., 16* (*1929*), *No. 1, pp. 27–36*).—The results obtained in the experiments here reported indicate that it is possible to transform an animal relatively resistant to the avian tubercle bacillus into a more or less susceptible one by previous treatment with a dead heterologous strain of tubercle bacilli.

"The consistent difference in the type of infection observed in the animals previously treated with the killed human strain and those treated with the killed bovine tubercle bacilli seems to indicate a difference in the preparatory influence of these two strains. However, . . . the fact that the septicemia appearing constantly in the bovine series affected only the females after parturition makes the interpretation of the findings in this series doubtful, and calls for further investigation."

The relation of avian tuberculosis to other animals, R. GRAHAM (*U. S. Egg and Poultry Mag., 34* (*1928*), *No. 8, pp. 48, 49, 62, 64, fig. 1*).—The data collected in the laboratory and confirmed in the field are said to indicate that an important part of the tuberculosis in swine in Illinois is of the avian type, and that cattle are also mildly susceptible. In order to protect the poultry industry as well as cattle and swine against the avian infection, more attention must be given to the eradication of the disease in fowls.

A contribution to the study of the parasitic life history of Strongylus equinus Mueller, 1780, together with a description of some lesions found in a donkey as a result of dosing with the infective larvae of this parasite, J. W. THWAITE (*Ann. Trop. Med. and Parasitol., 22* (*1928*), *No. 3, pp. 291–302, pl. 1, fig. 1*).—The author reports in detail upon the findings at post-mortem examination of a donkey fed with large numbers of the infective stage of the larvae of *S. equinus*. The results of a histological examination, a description of the larvae found in the liver, pancreas, and perirenal tissue, and a discussion of the results are included.

Differential medium for Salmonella pullorum, Salmonella gallinarum, Pasteurella avicida, and Escherichia coli, W. L. MALLMANN and D. SNYDER (*Jour. Infect. Diseases, 44* (*1929*), *No. 1, pp. 13–15*).—The authors here describe a dextrin-lactose agar medium for the differentiation of *S. pullorum*, *S. gallinarum*, *P. avicida*, and *E. coli*. It makes possible an accurate identification of any suspected culture in 48 hours.

Salmonella pullorum in the intestinal contents of baby chicks, W. L. MALLMANN (*Jour. Infect. Diseases, 44* (*1929*), *No. 1, pp. 16–20*).—The author reports upon a brilliant green, meat extract broth, enrichment medium devised for isolating *S. pullorum* and other paratyphoid intermediates from chick feces and intestinal contents. Supplementing the usual plating of heart, liver, and retained yolk at necropsy by examination of the intestinal contents with this medium increased the number of positive cases of *S. pullorum* by 10 per cent. Buffered extract broth was not as satisfactory as nonbuffered broth as a base medium for brilliant green enrichment medium. When *S. pullorum* was found in the organs of the chicks it was nearly always located in the intestinal contents. It was conclusively demonstrated that the infected chick is a fecal disseminator of *S. pullorum*, and it is pointed out that the presence of *S. pullorum* in chicks can be determined by the examination of the feces without killing the chick.

Further observations on the occurrence of white diarrhea infection in eggs laid by hens reacting to the agglutination test. R. A. RUNNELLS and H. VAN ROEKEL (*Poultry Sci.*, *6* (*1927*), *No. 5*, *pp. 229–232*).—This contribution from the Virginia Experiment Station supplements the data given in the account previously noted (E. S. R., 57, p. 380). The principal conclusions drawn from the experiment with 13 Rhode Island Red hens are said to be quite similar to those previously drawn from the experiment in which the White Leghorns were used.

It was found that hens reacting to the macroscopic agglutination test for white diarrhea infection usually lay some eggs infected with *Salmonella pullorum*. The degree of reaction to the agglutination test and the frequency of occurrence of *S. pullorum* in the eggs laid by reacting hens do not correspond, since a so-called high reactor may lay few infected eggs and a low reactor may lay several that contain this organism. Cultures were made of 169 eggs of which 33.7 per cent contained *S. pullorum*.

Comparison of serologic and pullorin tests for bacillary white diarrhea, L. D. BUSHNELL (*Jour. Infect. Diseases*, *43* (*1928*), *No. 1*, *pp. 60–66*).—This is a detailed report of work conducted at the Kansas Experiment Station.

The results of several years' experience are said to have shown the tube agglutination test to be effective in detecting and thereby eradicating bacillary white diarrhea, and that it may be used as a basis of comparison for other methods. The complement fixation test can not be used to advantage because of the difficulties of technique which prevent the use of low dilutions of serum. The rapid slide macroscopic agglutination test is considered as efficient in detecting reactive fowls as the tube methods and can be used as a substitute for the tube methods. The pullorin test, in its present stage of development, can not be recommended to replace the present agglutination methods for the diagnosis of bacillary white diarrhea. However, it is a promising field for further research in an attempt to cheapen the method.

New method tried for B. W. D. testing work, W. R. HINSHAW (*New England Poultryman*, *7* (*1928*), *No. 6*, *pp. 1044*, *1065*).—In work conducted in which 88 young birds in a flock were tested for the first time nearly a month before they started to lay, 82.6 per cent of all the reactors ever found in the flock were removed at the first test. By the time the flock reached 50 per cent production, all the reactors had been detected, and the remainder of the flock passed three nonreacting tests at monthly intervals during the season. The progeny of this flock had been tested just prior to the time of writing and found nonreactors. It is pointed out that the removal of a large percentage of infected pullets before they start to lay will do much to prevent further spread of the disease. The New England Conference of Laboratory Workers has adopted such testing of pullets, known as the Maine plan. The testing will commence with the heavy breeds when the majority of the birds weigh from 3 to 3.5 lbs.

Control of Salmonella pullorum infection (bacillary white diarrhea), 1927–1928, W. R. HINSHAW and E. F. SANDERS (*Massachusetts Sta. Control Ser. Bul. 43* (*1928*), *pp. 23*).—This is the eighth annual report upon control work with bacillary white diarrhea under the Massachusetts poultry disease elimination law, the seventh of which, by Van Roekel, has been noted (E. S. R., 57, p. 878). During the 1927–28 season, 232,091 agglutination tests were made on 190,658 birds and 321 flocks, an increase of 104,764 tests and 72 flocks. During the year 3.98 per cent of the poultry population of the State, 80,829 birds in 138 flocks, was found to be in nonreacting flocks, or twice the percentage of the preceding year, three times that of 1924–25, and over six times that of 1923–24.

Data are presented on the age at which pullets can be tested, an account of which from another source is noted above. A brief account of the disease and information regarding applications for the agglutination test are included.

Bacillary white diarrhea and its control, I, II [trans. title] (*Arch. Wiss. u. Prakt. Tierheilk., 56 (1927), No. 4, pp. 313–325; 57 (1928), No. 5, pp. 472–481*).—The first contribution, by A. Spiegl and Schmidt-Hoensdorf, consists of an introduction followed by a discussion of the pathological anatomy, histological investigations, bacteriology, epidemiology, and control. The second contribution, by F. Schmidt-Hoensdorf, deals with serodiagnosis, including agglutination and precipitation.

The question of vaccination against fowl pox and avian diphtheria [trans. title], W. Zwick, O. Seifried, and J. Schaaf (*Berlin. Tierärztl. Wchnschr., 44 (1928), No. 26, pp. 433–435*).—Experimental work conducted leads the authors to recommend the use of the mixed or double virus, as well as the original pigeon pox virus, for immunizing against fowl pox and avian diphtheria. Both are said to confer a lasting protective action under natural conditions.

Fowl pox, T. M. Doyle (*Jour. Min. Agr.* [*Gt. Brit.*], *35 (1928), No. 9, pp. 838–843; also in Vet. Rec., 9 (1929), No. 4, pp. 62–64*).—A practical summary of information on this disease of fowls, based upon work in England where it is the commonest contagious disease of the adult fowl.

Progress report on poultry disease investigation at the Michigan Experiment Station, H. J. Stafseth and W. L. Mallmann (*Poultry Sci., 8 (1928), No. 1, pp. 19–22*).—In reporting upon work with the agglutination test for bacillary white diarrhea, it is stated that since sodium hydroxide has been used in the antigen, as recommended by Mathews (E. S. R., 55, p. 275) for the purpose of preventing cloudiness, no zone phenomena have been observed in over 40,000 routine and experimental tests. This has led to the adoption of a one-tube test with a serum dilution of 1 : 50. As a differential medium excellent results were obtained with a 2 per cent base agar, pH 7 (final reaction), containing 1 per cent dextrin, 0.5 per cent lactose, and 1.5 per cent of a 0.4 per cent alcoholic solution of bromothymol blue. This medium was sterilized at 15 lbs. pressure for 20 minutes and slanted.

Brief reference is made to the use of a selective medium containing brilliant green, a detailed account of which has been noted (E. S. R., 60, p. 374).

A brief account is given of work with leg weakness and paralysis, which are thought to result from several distinct causes.

Preliminary report on poultry parasite investigation at Macdonald College, A. D. Baker, R. L. Conklin, W. A. Maw, and C. D. Fogerty (*Poultry Sci., 8 (1928–29), No. 2, pp. 59–76, figs. 9*).—The authors report upon a survey of internal parasites of poultry made in the vicinity of Macdonald College, Quebec. They succeeded in raising stock free from parasites up to the age of 6 months, descriptions being given of the pens used and the methods of feeding and caring for the birds. *Heterakis gallinae* and *Ascaridia lineata*, most commonly met with, were selected for a detailed study. The growth of the cecal worm is illustrated and the normal habitat explained. Artificial infection of pest-free birds over the age of 5 months with *A. lineata* was not successful, and it is very probable that resistance to infection increases with age.

A list is given of 44 references to the literature.

The present status of our knowledge of poultry parasitism, E. B. Cram (*Poultry Sci., 8 (1928), No. 1, pp. 35–38*).—This is an abstract of a paper summarizing the present status of the knowledge of poultry parasitism, and includes a list of 41 references to the literature.

Further studies on the longevity of the eggs of Ascaris lumbricoides and A. suum, H. W. Brown (*Jour. Parasitol., 15 (1928), No. 1, pp. 14–22, fig. 1*).—In further studies (E. S. R., 58, p. 475), the eggs of *A. lumbricoides* and *A. suum* in sandy soil cultures kept out of doors remained viable during the winter months of 1926–27 at Baltimore, Md. During this time the temperature alternated almost daily between freezing and thawing.

"All stages of embryonic development appeared to withstand the effects of freezing and thawing temperatures equally well. The warm and dry weather of April proved lethal to all of the eggs in all cultures and indicates that in nature, in sandy soil at least, the longevity of Ascaris eggs may be considerably shortened by these conditions. In an experiment in which the embryonated eggs of *A. suum* were dried at room temperature and were exposed to a temperature as high as 35° C. for a short time, the embryos were all killed within 37 days. Some were killed at 9 days, and at 28 days the great majority of the embryos were dead. Eggs dried for a period contain a bubble of gas which aids in the egg's destruction when moistened."

Effects of the nematode Ascaridia lineata (Schneider) on growing chickens, J. E. Ackert and C. A. Herrick (*Jour. Parasitol., 15 (1928), No. 1, pp. 1–13, pls. 2, fig. 1*).—This is a report of investigations conducted at the Kansas Experiment Station in which 411 chickens were raised in confinement with a view to determining the effects of *A. lineata*. The symptoms found to be the most pronounced in young chicks during the first 3 weeks of parasitism were sluggishness, loss of appetite, ruffled feathers, drooping wings, loss of blood and of body weight, retarded muscular and osteological development, urates in the ureters, and increased mortality.

"The observed effects of this nematode upon its host are attributed to injury by the parasite to the intestinal wall, loss of blood, probable bacterial infection, absorption of metabolic wastes from the worms, and partial inanition resulting from lost appetite. Elimination of nematodes from the intestine seemed to occur continuously from the time of hatching until most of the worms were lost, but the rate of loss was accelerated after about the eighteenth day. Chicks that survived 3 weeks of parasitism usually recovered, gradually gaining in strength and improving in plumage until they eventually approached and sometimes exceeded the controls in vigor, appearance, and performance. Chickens previously parasitized manifested a definite resistance to the nematodes by the time they were approximately 3 months old; but such chickens were significantly affected by subsequent parasitism from eggs given when the chicks were less than 3 months of age. Two tests on effects of *A. lineata* on egg production of chickens failed to show any retardation or inhibition of this process."

Syngamus trachea from the starling transferred to the chicken, and some physiological variation observed, E. L. Taylor (*Ann. Trop. Med. and Parasitol., 22 (1928), No. 3, pp. 307–318*).—The author finds that chickens may be experimentally infected with *S. trachea* of starlings. The first passage from starlings to chickens results only in a light infection, but after one passage through chickens it may produce a heavy infection.

"Other differences between the behavior of *Syngamus trachea* of starlings and of chickens have been observed: (1) In their rate of growth in the chicken; (2) in the proportion of larvae given in the experimental feed which develop to maturity in the chicken; and (3) in the position which they take up in the trachea of the chicken."

It is considered probable that the strain of *S. trachea* of starlings used in the experiments would be harmless to chickens under natural conditions. It is pointed out that *S. tracheu* is a species within which may be found a number of strains showing a peculiar physiological adaptation to the host in which they occur.

Foot disease of chipping sparrow (Spizella passerina), T. E. MUSSELMAN (*Auk, 45 (1928), No. 2, pp. 137–147, pl. 1*).—This is a contribution from the Baldwin Bird Research Laboratory on work at Thomasville, Ga., relating to a foot-deforming affection of the chipping sparrow caused by bird pox. It was found that the disease is infectious during the bleeding period, that it can be inoculated from one bird to another, and that the period of incubation is about 10 days. The enlargement of the blood sac was found to be at its height from the fifteenth to the eighteenth day, the cracking and bleeding extending from 3 days to a week. The disease generally does not affect the health of the bird, being limited to the feet except in rare cases A bird which has suffered 1 year is not immune and may be reinfected. Although deformed, the affected bird usually recovers but occasionally the disease proves fatal. It seems to be most active during the months of February and March.

Experimental tularemia infection in birds, R. G. GREEN and E. M. WADE (*Jour. Bact., 17 (1929), No. 1, p. 55*).—The authors report that the skin inoculation of the ruffed grouse and the Hungarian partridge with material infective for tularemia resulted in a fatal infection, which terminated in about 7 days. Upon intramuscular injection a generalized infection usually occurs in the common pigeon which does not result fatally and no symptoms of the disease are evident. The organism (*Bacterium tularense*) appears to be eliminated from the body of the pigeon in about 7 days. Intramuscular injection of infective material in the ring-necked pheasant results in a generalized invasion with no apparent symptoms of the disease, and recovery from the infection occurs after about 7 days.

AGRICULTURAL ENGINEERING

Engineering problems manual, F. C. DANA and E. H. WILLMARTH (*New York and London: McGraw-Hill Book Co., 1927, pp. XVIII+187, figs. 58*).—This manual, based largely upon practice at the Iowa State College, presents practical examples of the coordination of mathematics, physics, and practical engineering, together with a large amount of useful related data. It contains chapters on specifications for computation sheets, aims of engineering problems courses, some basic principles and notes on their use, notes on mathematics, computation methods, review problems, and miscellaneous tables.

Public Roads, [December, 1928] (*U. S. Dept. Agr., Public Roads, 9 (1928), No. 10, pp. 185-208, figs. 52*).—This number of this periodical contains the following article: Loading Tests on a Reinforced Concrete Arch, by A. L. Gemeny and W. F. Hunter

Pulverizing limestone on the farm, F. D. JONES (*Tennessee Sta. Circ. 23 (1928), pp. 4, figs. 3*).—The results of experiments on the grinding of limestone for agricultural use with the small hammer type of pulverizer are briefly presented.

Hard limestone, marble, and dolomite were used in the experiments. Of the three, the least power was required to pulverize marble, followed in order by the hard limestone and the dolomite. Increasing the speed of the machine was found to lower the power consumption. Also, as a general rule, the capacity of the machine increased as the speed increased. It was found, however, that none of the hammer machines should be operated at more than 1,500 r. p. m. The results indicated further that the size of the unpulverized material has little to do with the power consumption. Beating or breaking up the material beyond the point where it can enter the pulverizer does not pay under ordinary circumstances. The cost of pulverizing was found to be a variable figure, changing with every case.

Concrete, plain and reinforced.—Vol. II, Theory and design of continuous beams, frames, building frames, and arches, F. W. Taylor, S. E. Thompson, and E. Smulski (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, 4. ed., vol. 2, pp. XIII+688, figs. 272*).—This is the fourth edition of volume 2 of this book (E. S. R., 56, p. 882).

Effect of temperature on the strength of concrete, C. C. Wiley (*Engin. News-Rec., 102 (1929), No. 5, pp. 179–181, figs. 2*).—Studies conducted at the University of Illinois are reported, leading to the conclusion that all concrete should be protected from freezing for at least one week at a temperature of 70° F. or twice as long at a temperature of 35°. This is a radical departure from the common assumption that it is only necessary to protect concrete from freezing until it has attained final set. This freezing of concrete at an early age with the consequent permanent damage offers an explanation of the failure of certain structures built during cold weather.

Absorption of wood preservatives, J. D. MacLean (*Engin. News-Rec., 102 (1929), No. 5, pp. 176–179, fig. 1*).—This is an abstract of a paper presented at the convention of the American Wood Preservers' Association at Louisville, Ky., January 22–24, 1929, which reported studies conducted by the U. S. D. A. Forest Products Laboratory.

The results showed that present specifications for the preservative treatment of wood do not give sufficient attention to the variability in results that may occur when timbers of different lengths and different cross-section dimensions are treated in accordance with the specifications. Absorption by volume of timber is the most satisfactory and convenient method of specifying treatment provided it is based on a consideration of the ratio of surface area to volume. The ratio of surface area to volume does not need consideration when the timbers are largely sapwood or when an open, porous condition of the wood makes it possible to obtain practically complete penetration.

Data on proportional absorptions are tabulated to assist in determining the approximately correct absorptions for different classes of material.

Action of accelerators and inhibitors upon the oxidation of liquid hydrocarbons, T. E. Layng and M. A. Youker (*Indus. and Engin. Chem., 20 (1928), No. 10, pp. 1048–1052, figs. 9*).—Studies conducted at the University of Illinois are reported in which an apparatus and method were devised for determining the effect of various inhibitors and accelerators of knock upon the slow oxidation of hydrocarbon fuels. Data are given to show the effect of various substances upon the slow oxidation of n-heptane and its normal oxygen derivatives, gasoline, and kerosene. A surprising similarity is shown between the action of lead tetraethyl and various compounds of sodium and potassium, and also a difference in the action of lead tetraethyl and these compounds of sodium and potassium upon the oxidation of hydrocarbons, in the gas or liquid phases.

"It appears, then, that for a compound to have properties to be classed as a suitable antiknock, it must be an inhibitor of gas-phase oxidation and an accelerator of liquid-phase oxidation. Compounds which fail to approach lead tetraethyl but which have some effect as antiknocks appear to have their effect only in one of the phases present in the gas engine at the temperatures tested."

Importance of mixture ratio in rating fuels for knock, J. M. Campbell, W. G. Lovell, and T. A. Boyd (*Indus. and Engin. Chem., 20 (1928), No. 10, pp. 1045–1048, figs. 8*).—Studies are reported which showed that the tendency of a fuel to knock is very sensitive to changes in mixture ratio. Since the change in tendency to knock with changes in carburetor adjustment varies according to the composition of the fuel, it is necessary to choose some definite ratio mixture for knock-testing work if reproducible results are to be obtained. The use of mixture ratios giving maximum knock for each fuel is suggested as a convenient means for obtaining more consistent results between different laboratories.

The international trade in farm machinery [trans. title], K. RITTER (*Ber. Landw. Reichsmin. Ernähr. u. Landw.* [*Germany*], *n. ser., 6 (1927), No. 4, pp. 611–654; also in Agrarpolit. Aufsätze u. Vorträge, No. 10 (1928), pp. 48*).—Data are presented on the world production, marketing, and distribution of farm machinery.

Mechanical harvesting of cotton in northwest Texas, D. L. JONES, W. M. HURST, and D. SCOATES (*Texas Sta. Circ. 52 (1928), pp. 31, figs. 18*).—This circular presents the results of an investigation on the mechanical harvesting of cotton in northwest Texas, made in cooperation with the U. S. D. A. Bureau of Public Roads.

The cost of harvesting and ginning sledded cotton is shown to be approximately $10 per bale less than for picked or snapped cotton, but the prevailing penalty of about $10 per bale for sledded cotton did not justify the little advantage secured by sledding during the 1927 season, since labor was available for harvesting by other methods. Small particles of leaves adhering to the lint and immature or discolored fiber mixed with the good cotton are some of the factors responsible for the difference in grade. Mechanically harvested cotton, whether it is picked or stripped, is not necessarily of a lower grade than hand-picked cotton. Enough evidence was secured to prove that cotton harvested by either of these methods under proper conditions will be of good grade, it having been demonstrated that stripped cotton can not be distinguished from hand-picked cotton when properly handled.

The field spray plant in its dependence on the permeability of the soil, B. SCHÖNWÄLDER (*Kulturtechniker, 31 (1928), No. 5, pp. 361–411, figs. 18*).—In a contribution from the University of Breslau the results are reported of field and laboratory studies of the velocity of movement of water in soils which were made in connection with the development of the process of irrigation with liquid sewage. Experiments were conducted with specially prepared soils with pore spaces filled with water and with a mixture of air and water, and practical tests were made in the field of the results obtained.

It was found that the combination Krüger-Zunker filter formula for soil water at a temperature of 10° C. possesses a high measure of accuracy. This formula is

$$V_{10^\circ} = 0.375 \frac{J \cdot p}{(1-p)^2 \cdot U^2}$$

in which V_{10° is the velocity of movement at 10° in centimeters per second, J is the drainage head, p is the soil pore space, and U is the specific surface of the soil described by Zunker (E. S. R., 50, pp. 84, 86).

Exhaustive filter experiments showed an even better correspondence between the experimental results and a new formula

$$V_{10^\circ} = 1.048 \left(\frac{p}{(1-p) \cdot U} \right)^2 .$$

The air content of the soil was found to retard the velocity of movement of water, and, in fact, the permeability of a filter with pores filled with a mixture of air and water was only about half that of a filter with pores filled entirely with water.

It was found possible by determining the specific surface of samples of a field soil and the proportion of the soil grains smaller in diameter than 0.002 mm. to judge the adaptability of that soil for the disposal of liquid sewage by irrigation. The results as a whole, however, emphasized the importance of using small test fields, in order to eliminate so far as possible the factor of variability in the soils when establishing a relation between field and laboratory experiments.

Report on survey of fruit cold storage plants, H. J. Dana (*Wash. State Col., Engin. Expt. Sta., Engin. Bul. 24 (1928), pp.* [2]+*15*).—The results of a survey of 17 packing and cold storage plants for fruit in and around the Wenatchee district in Washington are presented. These include the consideration of 21 different refrigerating systems. No conclusions are drawn.

Additional coefficients of heat transfer as measured under natural weather conditions, F. C. Houghten, C. Gutberlet, and C. G. F. Zobel (*Jour. Amer. Soc. Heating and Ventilating Engin., 35 (1929), No. 2, pp. 63–73, figs. 12*).—Studies to determine the heat transmission through certain building wall and roof combinations under natural weather conditions are reported.

The coefficient of total transmission of heat per square foot of area per hour per degree temperature difference in the air on the inside and outside of the wall was found to be 0.16 for brick-hollow-tile wall, 0.305 for insulated steel deck roof, 0.29 for a 12-in. hollow concrete block wall, and 0.17 for a brick veneer wall.

Where the coefficients found are not in agreement with accepted values, the discrepancies usually can be accounted for by variation in construction. The conductivity of concrete is the only case showing marked discrepancy between measured and computed values, indicating that the coefficients used in the past may be too low and that heat flow through concrete walls of different mix and aggregate should be the subject of further study.

Stream pollution in Wisconsin (*Madison: Wis. State Bd. Health, Bur. Sanit. Engin., 1927, pp. XVIII+328, figs. 86*).—The results of the activities of the Conservation Commission and the State Board of Health of Wisconsin in the control of stream pollution from July 1, 1925, to December 31, 1926, are presented.

Experiments and data collected in regard to the treatment of industrial wastes indicate that the application of 3.25 lbs. of ferrous sulfate and 7.25 lbs. of lime per 1,000 gal. of waste, followed by satisfactory sedimentation, will reduce the oxygen demand of pea cannery wastes approximately 75 per cent. The initial cost of installing the necessary equipment for this treatment ranges from $2,000 to $2,800 for a two line cannery and the cost of operation from $13 to $15 per day. The installation of suitable save-all equipment will economically reduce the waste of paper-making material to approximately 0.5 lb. per 1,000 gal. of waste. Aeration and impounding of sulfite liquor from sulfite mills will reduce the oxygen demand 50 to 75 per cent.

Experiments in the chemical treatment of pea-cannery wastes preliminary to entering the sewer system at Ripon, Wis., demonstrated that the removal of the coagulated solids at the cannery is essential to prevent overloading of the local sewage-disposal plant during the canning season. Investigations in the preliminary treatment of knitting-mill wastes at Ripon indicated that lint and greasy constituents, which interfere with the normal operation of the sewage-disposal plant, can be removed by fine mechanical screening and ferrous sulfate and lime treatment.

Sewage and industrial waste treatment experiments at Waupun, Wis., indicated that preliminary sedimentation, chemical treatment, and aeration at the sewage-disposal plant would yield a satisfactory effluent.

Detailed data from chemical and biological surveys of streams are also presented.

RURAL ECONOMICS AND SOCIOLOGY

The United States governmental activities in the field of agricultural economics prior to 1913, J. T. HORNER (*Jour. Farm Econ., 10 (1928), No. 4, pp. 429–460, fig. 1*).—The development of governmental activity in agricultural economics from 1839 to 1913 is discussed, with numerous excerpts from official reports and a chart showing the steps in the development leading to the Bureau of Agricultural Economics, U. S. D. A.

Agricultural economics in Russia, A. TCHAYANOV (*Jour. Farm Econ., 10 (1928), No. 4, pp. 543–549*).—This is a brief statement regarding the important Russian treatises on agricultural economics published since the beginning of the seventeenth century and the work of the Agrarian Institute of the Peasant International and of the Scientific Research Institute of Agricultural Economics established in Moscow in 1919.

The economic position of agriculture, A. D. HALL (*Contemporary Rev., No. 746 (1928), pp. 137–149; also in Jour. Min. Agr. [Gt. Brit.], 35 (1928), No. 2, pp. 111–124; trans. in Ann. Gembloux, 34 (1928), No. 8, pp. 249–264*).—The causes of the depression in agriculture, and especially in Great Britain, are discussed, and the conclusion is reached that the low prices are due to a weakened demand rather than to overproduction, as increased production of food since the outbreak of the war has not kept pace with the increase in population. For Great Britain two lines of reform are recommended, a change of operations and methods with a view of reducing the amount of labor required and increased efficiency of farm labor.

The author states: "Our [British] capitalist farming will only resume its progress . . . when food scarcity gives rise to a stimulus of better prices."

The French translation is by A. Pion.

Graphical presentatian of Thuenen's theory of intensity, R. KRZYMOWSKI (*Graphische Darstellung der Thünenschen Intensitätstheorie. Stuttgart: Eugen Ulmer, 1927: trans. in Jour. Farm Econ., 10 (1928), No. 4, pp. 461–482, figs. 8*).—This publication is translated and annotated by P. G. Minneman.

Two graphic methods of presenting the laws of the theory of intensity set forth by J. H. von Thünen in 1826 in The Isolated State with Respect to Agricultural Economics[4] are given. The center point of the theory is a question of the comparative advantages of intensive and extensive agricultural enterprises, and the fundamental principle laid down is that at high prices for products a higher degree of intensity must be used than at lower prices. Graphs are also included demonstrating the effects of the following: Changes in the cost of production when all other conditions remain constant, quality of the soil, taxes computed on the basis of gross production, consumption and head taxes, duties on goods used in production, and the land tax.

The "representative firm" idea applied to research and extension in agricultural economics, F. F. ELLIOTT (*Jour. Farm Econ., 10 (1928), No. 4, pp. 483–498, figs. 3*).—This is an application of the "representative firm" idea of Marshall to agricultural economics. The typical or representative farm is defined as "a model farm in a frequency distribution of farms from the same universe." The advantages and uses of the idea are illustrated by comparisons of the results obtained using the mean of 100 farms from a representative type of farming area in the hard winter wheat belt and the results when the farms were classed into types according to size and organization.

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[4] Der Isolirte Staat in Beziehung auf Landwirthschaft und Nationalökonomie. Berlin: Wiegandt, Hempel & Parey, 1875, 3. ed.

The Brookmire estimates of cash income of farmers, L. M. GRAVES (*Jour. Farm Econ., 10 (1928), No. 4, pp. 499–505*).—The system of the Brookmire Economic Service, Inc., in estimating the cash income of farmers is described briefly.

Economics of strawberry production and marketing in Missouri, F. L. THOMSEN and G. B. THORNE (*Missouri Sta. Bul. 262 (1928), pp. 138, figs. 54*).—The growth of the strawberry industry and the present cooperative organization and marketing processes in Missouri are described. How strawberry prices are determined, production, costs, prices, methods of reduction of marketing costs, and what the grower, the local association, and the central sales agencies can do to obtain better prices are discussed. Charts and correlation coefficients are given showing the relation between acreage and production, acreage and price, and production and price in the United States, the intermediate strawberry States, and Missouri by years, 1918–1927.

Correlation of the top prices at different markets with prices at the Monett (Mo.) auction with different number of days lag gave the highest correlations with the following lags: Chicago and Kansas City, 1 day; Minnesota, St. Louis, Detroit, Indianapolis, and Pittsburgh, 2 days; and Cincinnati, 3 days. Data on 187 patches of strawberries totaling 542 acres in southwestern Missouri showed that the cost of development per acre averaged $76.89 and the cost of production $104.46 per acre, or $2.30 per crate. The average cost per crate decreased from $4.21 for yields of 10 to 19.9 crates per acre to $1.75 for yields of 90 crates and over. The average cost per acre decreased from $136.28 for patches of 0.1 to 2 acres to $95.98 for patches of 8.1 acres and over. The returns per acre were $41.81 and $19.22, respectively, for the two groups.

Local associations shipping less than three carloads per year received 92 per cent of the average price, while those shipping from 9 to 11.9 carloads and 12 carloads or over received 102.6 and 101 per cent, respectively. The percentage of the prices received by associations having operated but one year increased from 101.7 for those in operation two years to 113.9 per cent for those in operation six years or more. The percentage of the average price received decreased 1.5 per cent for each zone of 15 miles from Monett up to 60 miles, and 5.6 and 2.5 per cent, respectively, for the next two zones.

A survey in 1927 of 143 grocery stores and 344 consumers in Milwaukee, Chicago, Kansas City, and St. Louis showed that only 51.3 per cent of the customers of the stores bought strawberries, only 46.8 per cent had a preference as to State of origin, and that the upper price limits were from 31.3 to 35 cts. for table use and from 13.5 to 15.6 cts. for canning. The average selling price per crate was $6.09, and the average retailer's margin 16.8 per cent. Of the consumers, 6.6 per cent reported no use of strawberries, 26.5 per cent a preference as to State of origin, and the average highest price in the four markets for canning ranged from 13.9 to 15.3 cts., and for table use from 27.5 to 44.4 cts. The average gross wholesale profits and margins per crate on 53 cars of Missouri berries shipped to the four markets in 1927 were 20.8 and 81 cts., respectively.

Systems of livestock farming for the mountain region of North Carolina, R. J. SAVILLE (*North Carolina Sta. Bul. 260 (1928), pp. 55, figs. 13*).—This bulletin, the third in the series previously noted (E. S. R., 57, pp. 191, 783), is based upon a study made in cooperation with the North Carolina Department of Agriculture and the Bureau of Agricultural Economics, U. S. D. A., of the existing organization and methods of operation on 25 Macon County farms in 1926.

Tables of yields and prices for standard organizations are given. The equipment and crop and livestock systems for standard farms of 30, 40, and 60 acres are suggested, and tables and graphs are given showing the probable crop and livestock production, probable disposition of products, distribution of man labor and horse work, suggested fertilizer and seed requirements, probable income, and organization adjustments suggested to meet price changes on such farms. The results of an actual reorganization of a 40-acre farm are included.

Costs and margins and other related factors in the distribution of fluid milk in four Illinois market areas, C. A. Brown (*Illinois Sta. Bul. 318 (1928), pp. 169–282, figs. 18*).—This bulletin reports the results of a survey begun about April, 1926, and intended primarily to study dealers' costs and margins in the four large markets for which Illinois dairymen produce milk. It covers the years 1925 and 1926 for Chicago, 1924 to 1926, inclusive, for St. Louis and Peoria, and 1924 to 1927, inclusive, for Quincy. Statistics for the production of the State, and for the production and the factors affecting it and the seasonal variations in butterfat content in each of the four districts are given and discussed. The marketing agencies and contributory organizations and assembling and processing plants are described. The per capita consumption, trend in sales, seasonal and daily variations in sales, demand for different sales units, the amounts, causes, and disposal of dealers' surpluses, and the effect of dealers' surpluses on producers' prices are discussed.

The average dollar spent by the consumer for wholesale and retail milk in the periods studied was distributed in Chicago, St. Louis, Peoria, and Quincy, respectively, as follows: Cost of product, 54.32, 48.56, 34.13, and 30.82 cts.; dealers' expenses, 50.88, 43.44, 32.39, and 28.06 cts.; and dealers' margins, 3.44, 5.12, 1.74, and 2.76 cts. Data regarding net margins on retail sales in Chicago indicated that milk quarts yielded a profit of 0.75 ct. and milk pints a loss of 1.56 cts. The dealer's gross margin per quart in Chicago was 8.7 cts. in 1925, 8.5 cts. in 1926, and 8.6 cts. in 1927. Of the dealers' expenses, from 43.56 per cent in 1924–1926 in Peoria to 65.11 per cent in 1925–1926 in Chicago were labor, salaries, and commissions, and from 10.81 per cent in Chicago in 1925–1926 to 19.04 per cent in Quincy in 1924–1927 were for processing and operating, materials, and supplies.

The various factors affecting dealers' margins are discussed.

Livestock trucking by Illinois shipping associations, R. C. Ashby (*Illinois Sta. Circ. 331 [1928], pp. 27, figs. 5*).—The methods, costs, and experiences of 15 Illinois cooperative livestock shipping associations that have or are attempting truck service are described. Of these, 5 reported the service to terminal markets only, 7 truck-in service only, and 3 both types of service. Eight associations reported trucking successful, 3 unsuccessful, and 4 that trucking was starting out well.

A table is given showing comparative itemized actual costs per hundredweight in 1927 of shipping 1,000-lb. cattle and 250-lb. hogs by the two methods to Peoria from a point 55 miles distant. The total costs were 48.5 and 55.8 cts., respectively, by truck, and 34 and 37 cts., respectively, by rail. Transit insurance, yardage, and commissions were found to be higher on truck shipments. Stockmen reported shrinkage on hogs as high by truck as by rail.

Report of the Saskatchewan Overseas Livestock Marketing Commission, 1927, W. W. Swanson et al. (*Regina: Saskatchewan Dept. Agr., 1928, pp. 425, pls. 8, figs. 48*).—This is the report to the Saskatchewan Agricultural Research Foundation of the commission appointed to make investigations relative to marketing Canadian livestock in Great Britain and the cooperative bacon factories in England, the Irish Free State, and Denmark.

The economic conditions in European agriculture; agriculture, agricultural cooperation and credit, educational and social factors, and the bacon industry in Denmark, Poland, the Baltic States, Germany, Netherlands, Russia, and Ireland; the bacon and pork industry and the market situation in Great Britain; the conditions in the hog industry, production problems, and marketing organization and problems in Canada; and the Canadian cattle industry and its export, transportation, finance, and packing and marketing problems are discussed.

The Paterson plan and Australian butter prices, P. F. Brookens (*Jour. Farm Econ., 10 (1928), No. 4, pp. 540–542*).—This is a brief description of the operation, difficulties, and results of the plan administered by the Australian Stabilization Committee since January 1, 1926, whereby butter producers voluntarily assess themselves on all production to compensate butter exporters.

Crops and Markets [December, 1928] (*U. S. Dept. Agr., Crops and Markets, 5 (1928), No. 12, pp. 441–496, figs. 2*).—Herein are given the usual tables, graphs, notes, reports, and summaries, and tables showing by States the acreage, yield per acre, production, farm price, and farm value of important field crops, 1927–1928, and commercial truck crops, 1925 or 1926 to 1928.

The Government cotton crop reporting system, W. F. Callander (*Internatl. Cotton Bul., 6 (1928), No. 22, pp. 237–256*).—The organization and methods of handling the cotton report of the U. S. Department of Agriculture, and the methods used by the Crop Reporting Board in determining acreages planted and harvested and in making forecasts or estimates of size of crop and probable yield per acre are described.

Practical cooperative marketing, A. W. McKay and C. H. Lane (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. XVII+512, figs. 161*).—This book is prepared for the use of vocational agricultural schools and farmers interested in the aims and policies of cooperative organizations. The characteristics of cooperative marketing associations are discussed, and the practices and policies of successful associations of producers of different agricultural products are described. The factors leading to success are analyzed chiefly under headings in the form of questions which each farmer may apply to the associations he is interested in. Lists of questions and references follow each chapter.

The appendix includes the cooperative marketing act of Kentucky; forms of articles of incorporation, by-laws, and contracts; a list of standards for farm products; and a list of periodical reports relating to crops, markets, and agricultural economics.

American cooperation (*Washington, D. C.: Amer. Inst. Coop., 1928, vols. 1, pp. XVIII+573, figs. 5; 2, pp. V+662, figs. 15*).—A collection of papers, discussions, etc., comprising the fourth summer session, July 9 to August 4, 1928, of the American Institute of Cooperation, which consisted of three weeks of educational conferences in the field of agricultural cooperation, held at the College of Agriculture of the University of California and at various points in southern and central California. The papers and the discussions thereon on the different subjects included in volume 1 are as follows:

Status and progress of agricultural cooperation.—Address of Welcome, by W. W. Campbell (pp. 3–5); Response to Address of Welcome, by C. C. Teague (pp. 5–8); Greetings to the Institute, by W. M. Jardine (pp. 9–13); The Evolving Idea of Cooperation in the United States, by E. G. Nourse (pp. 13–26); The Present Situation in Agricultural Cooperation in the United States, by L. S. Tenny (pp. 27–38); Post-War Development of the Cooperative Movement in the Countries of the British Empire, by C. R. Fay (pp. 39–63);

The Progress of Agricultural Cooperation in Western Canada, by J. E. Brownlee (pp. 63–80); and Types of Cooperatives, by H. E. Erdman (pp. 80–88).

Cooperative organization in southern California and in central California.—Papers were presented on the organization and operation of associations as follows: California Walnut Growers Association, by C. Thorpe (pp. 91–104); Puente Walnut Growers Association, by S. L. Watts (pp. 104, 105); California Fruit Growers Exchange, by P. S. Armstrong (pp. 106–121); Riverside-Arlington Heights Fruit Exchange, by H. A. Lynn (pp. 122, 123); San Dimas Lemon Association, by H. J. Ramsey (pp. 124–129); Placentia Mutual Orange Association, by H. O. Easton (pp. 129–131); Exchange By-Products Companies, by E. T. Castle (pp. 131, 132); Mutual Orange Distributors, by B. McDaniel (pp. 133–143); Calavo Growers of California, by G. B. Hodgkin (pp. 143–146); Poultry Producers of Southern California and the Poultrymen's Cooperative Milling Association, by H. M. Ameluug (pp. 147–161); Challenge Cream and Butter Association, by C. W. Hibbert (pp. 162–175); California Milk Producers Association, by T. H. Brice (pp. 176–186); Sun-Maid Raisin Growers of California, by J. L. Read (pp. 189, 190); Sun-Maid Raisin Growers Association, by A. M. Paul (pp. 190, 191); California Peach and Fig Growers Association, by E. I. Feemster (pp. 192, 193); California Fruit Exchange, by L. S. Haight (pp. 194–199); Sanger Citrus Growers Association, by R. J. Senior (pp. 200, 201); Danish Creamery Association, by J. L. Murphy (pp. 202–205); San Joaquin Agricultural Labor Bureau, by F. J. Palomares (pp. 206, 207); California Vineyardists Association, by L. Monahan (pp. 207–209); California Prune and Apricot Growers Association, by C. D. Cavallaro (pp. 209–218); and Petaluma Branch of the Poultry Producers of Central California, by R. H. McDrew (pp. 223–228); and Marketing Gravenstein Apples, by J. McDonald (pp. 219–223).

Members' attitudes and membership problems.—What Studies of Membership Attitudes have Revealed, by J. W. Jones (pp. 231–241); Membership Policies of the Sun-Maid Raisin Growers, by F. A. Stewart (pp. 255–257); Dealing with Nonmembers, by J. Lawler (pp. 258–264); Cooperative Marketing Problems in Oregon, by M. J. Newhouse (pp. 264–271); Phases of the California Cooperative Marketing Problem, by E. Gundelfinger (pp. 272–275); and papers on Selective Membership Policies for Cooperatives, by C. Thorpe (pp. 241–249) and by R. M. Hagen (pp. 250–254).

Marketing contracts.—Withdrawal Features of Cooperative Contracts, by M. Sapiro (pp. 279–301); Contracts or other Membership Control Methods, by E. J. Tracy (pp. 302–323); and Present Legal Status of Membership Contracts, by L. S. Hulbert (pp. 324–345).

Organization, publicity, and field service.—Local Organization Technique, by C. F. Milliken (pp. 349–360); Program of the California Walnut Growers Association, by C. Thorpe (pp. 361–365); Special Reports to Members, by R. H. McDrew (pp. 366–375); The Purpose of a House Organ, by E. D. Schlaman (pp. 376–382); Advertising in House Organs of Cooperatives, by B. McDaniel (pp. 382–388); Weekly vs. Monthly Publication, by S. D. Sanders (pp. 389–400); A Section in an Agricultural Paper as a Substitute for a House Organ, by W. B. Geissinger (pp. 400, 401); A Section in an Agricultural Paper as a Substitute for a Cooperative House Organ, by D. L. Kieffer (pp. 402–406); and papers on Field Service of the California Fruit Growers Exchange, by C. F. Milliken (pp. 406–412); of the California Fruit Exchange, by F. W. Read (pp. 412–417); of the California Walnut Growers Association, by A. W. Christie (pp. 417–422); and of the Land O'Lakes Creameries, by H. F. Meyer (pp. 422–427).

Financing cooperative associations.—Credit Extension by the Cooperative to Growers, by E. L. Adams (pp. 452–460); Cooperative Withholding Finance Plan of the California Fruit Exchange, by J. J. Brennan (pp. 461–468); The Revolving Fund Finance Plan in Operation, by J. Lawler (pp. 469–479); Purpose and Organization of Subsidiaries, by H. M. Creech (pp. 479–490); and papers on Factors We Consider in Lending to Cooperatives, by W. D. Ellis (pp. 431–433) and by W. M. Buckles (pp. 434–452).

Cooperation between commodity groups.—National Unity for Cooperators, by C. W. Holman (pp. 493-508); Organization, Set-up, and Work of Agricultural Legislative Committee, by R. H. Taylor (pp. 535–538); History of the Oregon Cooperative Council, by P. V. Maris (pp. 539–554); and papers on How Commodity Groups Can Best Effect Further Cooperation, by C. O. Moser (pp. 508–515), S. D. Sanders (pp. 516–519), E. R. Downie (pp. 520–527), and R. A. Ward (pp. 528–534).

Volume 2 includes papers and discussions thereon as follows:

Progress and problems of standardization.—The Objectives of Standardization, by F. W. Read (pp. 3–8); California Standards for Fruits and Vegetables, by W. F. Allewelt (pp. 8–15); The Desirability of Standards for Dried Peaches and Figs, by E. Gundelfinger (pp. 29–34); Pecan Grades and Standards, by W. P. Bullard (pp. 45, 46); Standardization and Grading of Dairy Products, by F. H. Abbott (pp. 61–68); Standardization Program of Land O'Lakes Creameries, by H. F. Meyer (pp. 72–80); New York Egg Law, by S. D. Sanders (pp. 80–89); Need of Standardization in the Egg Industry, by H. G. F. Hamann (pp. 90–101); Wool Standardization and Grading in Foreign Countries, by J. F. Walker (pp. 102–104); Grading and Marketing of Wool in California, by J. F. Wilson (pp. 104–108); and Standardization of Walnuts, by A. W. Christie (pp. 16–29); of Raisins, by P. F. Nichols (pp. 34–39); of Dried Prunes, by E. J. Shaw (pp. 40–45); and of Dairy Products, by J. L. Mitchell (pp. 68–71); and Standardization in the Olive Industry, by J. J. Hoey (pp. 47–60).

Selling, price policies, and pooling.—Problems Encountered in Foreign Marketing, by W. A. Schoenfeld (pp. 111–122); The Place of Pooling in Cooperative Marketing, by C. L. Christensen (pp. 122-134); The Advertising of Agricultural Specialties, by D. Francisco (pp. 134–154); The Possibilities and Limitations of General Advertising Campaigns, by P. S. Armstrong (pp. 154–164); Sales Relations between Cooperatives Marketing the Same Commodity, by B. McDaniel (pp. 165–184); Aims and Methods of Collective Bargaining, by H. D. Allebach (pp. 184–197); Conference on Sales Methods of Milk-Marketing Associations, by J. McGill, jr., et al. (pp. 207–226); Placing a Commodity on the Market, by C. W. Hibbert (pp. 226–228); Developments in Sales Methods and Practices, by S. D. Sanders (pp. 229–234); Sales Methods—Eggs, by J. B. Christensen (pp. 235–243); Sales Methods of Land O'Lakes Creameries, by H. F. Meyer (pp. 243–259); Conference on Cattle Sales Methods, by R. M. Hagen et al. (pp. 259–288); and papers on Collective Bargaining in Pears, by M. Sapiro (pp. 198–202), and in Sugar Beets, by M. S. Winder (pp. 203–207).

Fruit and vegetable clearing house plans.—The Agricultural Cooperative as Trade Association, by A. E. Taylor (pp. 291–310); The Northwest Fresh Prune Clearing House, by F. Shields (pp. 311–319); The Quotation Committee Plan of the Eastern Shore Farmers' Association, by F. B. Bomberger (pp. 319–329); Results Obtained and General Effect of the Operation of the Apple Clearing House, by E. C. Merritt (pp. 330–334); The British Columbia Fruit Plan, by C. R. Fay (pp. 335–338); The Florida Citrus Growers Clearing House Association, by C. L. Christensen (pp. 339–353); and Conference on Fruit and Vegetable Clearing House Plans, by W. A. Schoenfeld et al. (pp. 354–368).

Surplus control plans of cooperatives.—Experience with Surplus Disposal and Control Plans, by C. C. Teague (pp. 371–385); Control and Disposal of Surplus Milk, by I. W. Heaps (pp. 385–394); and papers on Experience with Surplus Disposal and Control Plans, by E. L. Adams (pp. 395–403) and by E. H. Haack (pp. 404–407).

Cooperative business methods.—Application of Commercial Methods to Cooperatives, by H. M. Creech (pp. 411–424); Market Control vs. Sound Business Management, by M. L. Corey (pp. 424–438); Conference on Management Problems of Cooperatives, by A. V. Swartout et al. (pp. 438–458); and Conference of Sales Managers and Advertising men, by P. S. Armstrong et al. (pp. 458–469).

Cooperative buying.—Cooperative Purchasing in the East, by C. C. Taylor (pp. 473–482); and Group Buying by Farmers' Elevators, by J. W. Shorthill (pp. 483–495).

There is also included a study of the growth and failure of the Burley Tobacco Growers Cooperative Association, by V. Elsinger (pp. 499–621).

A business study of the Ohio Poultry Producers' Cooperative Association, L. G. Foster (*Ohio Sta. Bul. 427 (1928), pp. 38, figs. 9*).—This bulletin is devoted chiefly to a description and analysis of the organization and operation of the Ohio Poultry Producers' Cooperative Association from July 15, 1925, to June 30, 1927. The unit costs of the association for handling were 5.48 cts. per dozen for eggs and 4.35 cts. per pound for poultry.

A study by J. I. Falconer, V. R. Wertz, and G. F. Kendrick of the egg prices received by more than 40 farmers in the association and about 30 farmers in three counties not in the cooperative area showed that the cooperators had received an average of 0.8 ct. more per dozen than did the noncooperators.

Cooperative butter marketing in Wisconsin, T. Macklin and M. A. Schaars (*Wisconsin Sta. Bul. 401 (1928), pp. 39, figs. 9*).—This bulletin is based upon data secured by personal visits to 182 cooperative creameries in 29 counties, being 64.3 per cent of the cooperative creameries in the State.

Forty-six of the creameries studied graded cream, but only 31 paid on a graded basis, of which 16 were in a cooperative sales organization. Butter was sold on a 92 score basis by 156 of the creameries in 1925. Of the butter of the creameries in Polk and Burnett Counties selling cooperatively, 81.5 per cent was 93 sweet cream in 1925 and 90.82 per cent in 1927.

Comparisons of costs, net prices received for butter shipped to New York City, and prices paid for butterfat per pound in 1925 by groups of creameries arranged according to size showed the following, respectively, for the groups making from 150,000 to 450,000 lbs. of butter per year and those making 1,350,000 lbs. and over: Hauling cream per pound of butter 1.46 and 1.125 cts., butter making 3.055 and 2.107 cts., net price received 43.337 and 43.383 cts., and price paid for butterfat 49.513 and 51.847 cts. The advantages in the immediate groups usually increased with size of creamery.

Comparisons of prices and of costs of 14 federated creameries and 4 other groups of similar number and size showed that the federated group received from 0.647 to 1.333 cts. per pound more for butter and paid from 0.814 to 1.695 cts. per pound more for butterfat.

A description of and statistics for the butter industry of the tri-State (Wisconsin, Minnesota, and Iowa) butter region, and information as to the organization and methods of Wisconsin cooperative creameries are also included.

The cooperative society movement in Palestine, N. Bentwich (*Égypte Contemporaine, 19 (1928), No. 110, pp. 553–564*).—A brief description of the legislation pertaining to and the present status of cooperative associations in Palestine.

Agricultural workers and agrarian reform in central Europe, A. Rose (*Internatl. Labor Off.* [*Geneva*], *Internatl. Labor Rev.*, *18* (*1928*), *No. 3*, *pp. 307–338*).—A brief survey is made of the views relative to the value of large and small scale farming put forth since the middle of the nineteenth century, and the effects on agricultural workers of the redistribution of land in Austria, Czechoslovakia, Germany, Hungary, Poland, Rumania, Estonia, Latvia, and Lithuania under the postwar agrarian legislation are discussed. An analysis is made by countries of the postwar legislation. The difficulties met, the practical value of, and the results obtained in forming workers' cooperative societies, the establishment of workers as settlers, and the payment of compensation and transfer to other occupations of workers thrown out of employment in the several countries are discussed.

The opinion of the author is that the adoption of a policy of workers' protection will automatically eliminate badly managed large estates, but will leave those capable of providing their workers with satisfactory living and working conditions.

The migration to towns and cities, I–IV, C. C. Zimmerman et al. (*Amer. Jour. Sociol.*, *32* (*1926*), *No. 3*, *pp. 450–455*; *33* (*1927*), *Nos. 1*, *pp. 105–109*; *2*, *pp. 237–241*; *Jour. Farm Econ.*, *10* (*1928*), *No. 4*, *pp. 506–515*).—These papers discuss different phases of migration from farms to towns and cities and from towns and cities to farms in Minnesota.

Part 1 is based upon data from 357 farm families taken at random from seven representative farming areas of Minnesota by the Minnesota Experiment Station. It was found that 88.5 per cent of the fathers of the farmers and 82.5 per cent of those of the farmers' wives were farmers. Of the children who had left home, 40 per cent had become farmers and 60 per cent had migrated to cities, 23 per cent being unskilled laborers, 13.8 per cent artisans, 10.4 per cent clerical, 10.1 per cent professional men or women, and 2.6 per cent owners of businesses or entrepreneurs. Of the 60 per cent migrating to the cities, 36 per cent went to cities of over 10,000, 9 per cent to cities of less than 10,000, and 15 per cent to villages. The tendency to marry was less among the migrants than among those who stayed on the farm. More females migrated than males.

Parts 2 and 3 are based upon data collected by the Minnesota Experiment Station from 694 Minnesota farm families selected by random sampling and included 781 children 18 years of age or over. Part 2 deals with the migration of the children on the basis of the income groups of the families. It was found that the percentages of total migrants and of migrants to larger cities were considerably above the expectancy for the under $1,400 income group and considerably below for the groups with incomes over $3,800. In the under $1,400 group, 4.5 and 8.8 per cent, respectively, less than the expectancy became farmers or went into the clerical, entrepreneurial, and professional classes, and 15.8 per cent more than the expectancy into the laborer classes. In general the percentage becoming farmers increased and the percentage entering the other classes decreased with the increase in the amount of income, except in the $1,401–$2,600 and the $2,601–$3,800 groups, where 2.1 and 12.6 per cent more than the expectancy went into the clerical, entrepreneurial, and professional classes.

Part 3, by Zimmerman, O. D. Duncan, and F. D. Frey, deals with the migration from cities to the farms. In 128 families one parent and in 30 families both parents were from urban families. In the case of the one parent migration, 21.1 and 60.1 per cent, respectively, were unskilled laborers, and skilled and semiskilled laborers. Where both parents migrated from the city, the percentages were 17.2 and 60 per cent, respectively. The total number of migrants to towns was 275, as compared with 186 from towns to the farms, the net loss to the farms being 49, 26, and 38, respectively, from the common labor, clerical, and professional classes, and the net gain to the farms being 18 and 6 from the skilled and semiskilled labor and the business classes.

The authors conclude that migration from towns and cities to the farms has not materially reduced the economic ability of the farm population, and that cities attract the extremes and farms the mean strata in society.

Part 4, by Zimmerman and Duncan, is based upon a study in 1927 of the incomes, expenditures, and budgetary behavior of 395 families in 11 towns and villages around which the families studied in parts 2 and 3 live. Of the heads of households, the percentages born on farms and having lived on farms were, respectively, 62.2 and 74.2 for laborers, 48.7 and 64.1 for the clerical and managerial group, and 54.5 and 63.5 for the business and professional group. It was found that while children of farmers constituted 65.1 per cent of the total village and town population, they constituted 66.5 per cent of those in the business and professional classes, and that 41, 37.4, 27.2, and 13.5 per cent, respectively, of the children of widows, retired farmers, unskilled laborers, and business men became farmers.

The authors reached the further conclusion from this study that the agricultural village and town primarily represent a division of labor among farming people, and therefore there is no important factual basis for town-country antagonism, and that farmers are not declining in native ability due to the migrations of a select group to towns and cities.

[Annual report of the Social Science Research Council, 1927–28] (*Social Sci. Research Council Ann. Rpt., 4 (1927–28), pp. 56*).—This, the fourth annual report, includes lists of the constituent organizations, officers, members, committees, research fellowship appointments in the social sciences and in agricultural economics and rural sociology, and grants-in-aid; reports on the current developments and the status of the research program under the several advisory committees; the report of the committee on scientific method in the social sciences; and the financial report.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Efficiency in vocational education in agriculture, G. A. SCHMIDT (*New York and London: Century Co., 1928, pp. [XVII]+314, pl. 1, fig. 1*).—Following the introductory chapters dealing with the importance of agriculture in the United States; the demands of the occupation; the aims, needs, and opportunities for vocational education in agriculture; and the purposes and elements of all vocational training courses, the 16 standards set up by Prosser and Allen[5] as characterizing an efficient plan for vocational education are discussed and applied to vocational education in agriculture. The final chapter outlines two methods of evaluating a program of vocational education in terms of Prosser and Allen standards.

Vocational education in agriculture, 1917–1927, C. H. LANE and A. P. WILLIAMS (*Fed. Bd. Vocat. Ed. Bul. 134 (1928), pp. V+34, figs. 7*).—A review of the developments in vocational education in agriculture during the period that such education has been carried on cooperatively between the Federal Board for Vocational Education and the State boards for vocational education.

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[5] Vocational Education in a Democracy, C. A. Prosser and C. R. Allen. New York and London: Century Co., 1925, pp. 211, 212.

Agriculture: The science and practice of British farming, J. A. S. Watson and J. A. More (*Edinburgh: Oliver & Boyd, 1928, 2. ed., rev. and enl., pp. X+728, pls 34, figs. 60*).—A revised and enlarged edition of the text previously noted (E. S. R., 52, p. 96).

A laboratory manual of general botany, E. L. Fisk and R. M. Addoms (*New York: Macmillan Co., 1928, pp. IX+103*).—This manual is the outgrowth of manuals used in the elementary courses in botany at the University of Wisconsin.

Livestock enterprises, K. C. Davis (*Philadelphia and London: J. B. Lippincott Co., 1928, pp. IX+492, figs. 239*).—This text follows the job-analysis plan of organizing the subject matter. Seven enterprises are considered as follows: Dairy, by H. P. Davis (pp. 1–98), 15 jobs outlined; beef, by L Wermelskirchen (pp. 99–164), 18 jobs outlined; horse and mule, by S. Dickinson (pp. 165–222), 12 jobs outlined; swine, by W. H. Smith (pp. 223–279), 13 jobs outlined; sheep, by W. C. Coffey (pp. 281–350), 15 jobs outlined; poultry, by H. W. Nisonger (pp. 351–447), 12 jobs outlined; and bee, by K. C. Davis (pp. 449–462), 5 jobs outlined.

The appendix includes lists of reference books and livestock breed associations, and tables of composition of barnyard manures, weights of concentrated feeding stuffs, digestible nutrients and fertilizing values of feeds, and other data.

Farm mechanics, A. M. Field, R. W. Olson, and V. E. Nylin (*New York and London: Century Co., 1928, pp. XXVI+385, pl. 1, figs. 258*).—A guidebook for farmers and students in vocational agriculture covering ordinary repair and construction work.

Success on irrigation projects, J. A. Widtsoe (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. V+153*).—This volume is a compilation of lecture notes used several times in a course in irrigation economics at the National Summer School of the Utah Agricultural College.

Farm economics: Management and distribution, F. App (*Philadelphia and London: J. B. Lippincott Co., 1928, 2. ed., rev., pp. 700, figs. 248*).—A revised edition of the textbook previously noted (E S. R., 52, p. 197).

The teaching of home economics, C. M. Brown and A. H. Haley (*Boston: Houghton Mifflin Co., 1928, pp. XII+395, figs. 2*).—This text is planned for special methods courses in colleges and universities. The relation of educational psychology to the teaching of home economics, the objectives of and curriculum for home economics education, the organization of home economics in all-day schools and in evening and part-time classes, the methods of teaching applicable to the study, the measurement of results, equipment, aids to teaching, and other phases are discussed. Each chapter is followed by lists of questions and references.

An appendix includes score cards, rating scales, unit instruction sheets, and other data.

Home economics in education, I. Bevier (*Philadelphia and London: J. B. Lippincott Co., 1928, 2. ed., rev., pp. 256*).—This is a revised edition of the book previously noted (E. S. R., 52, p. 197).

FOODS—HUMAN NUTRITION

The elements of the science of nutrition, G. Lusk (*Philadelphia and London: W. B. Saunders Co., 1928, 4. ed., reset, pp. 844, figs. [47]*).—A revision and enlargement of this well-known volume (E. S. R., 38, p. 468).

Health appeal (*Jour. Amer. Med. Assoc., 91 (1928), No. 23, pp. 1806, 1807*).—A timely editorial on the exaggerated "health appeal" in modern advertising.

The control of protein in the diet, E. F. Du Bois (*Jour. Amer. Dietet. Assoc., 4 (1928), No. 2, pp. 53–76, figs. 6*).—This extensive review of the literature of the past two decades on protein requirements in health and disease shows the present tendency toward higher standards and the belief that in certain diseases the possibility of partial protein starvation should be given greater attention. A list of 57 references to the literature is appended

The availability of disulfide acids as supplementing agents in diets deficient in cystine.—II, α-dihydroxy-β-dithiodipropionic acid, B. D. Westerman and W. C. Rose (*Jour. Biol. Chem., 79 (1928), No. 2, pp. 413–421, figs. 2*).—Continuing the investigation previously noted (E. S. R., 58, p. 389), the authors have conducted similar experiments with α-dihydroxy-β-dithiodipropionic acid as a substitute for cystine. Although this compound bears the same structural relationship to cystine as *dl-β-4*-imidazole lactic acid does to histidine (E. S. R., 56, p. 86), it proved incapable of replacing cystine in the diet.

Carbohydrate metabolism and insulin, J. J. R. Macleod (*Kohlehydratstoffwechsel und Insulin. Berlin: Julius Springer, 1927, pp. IX+381, figs. 33*).—A German translation, by H. Gremels, of the volume previously noted (E. S. R., 55, p. 694).

The iodine content of Cape Cod cranberries, F. W. Morse (*Jour. Biol. Chem., 79 (1928), No. 2, pp. 409–411*).—Three lots of cranberries from southeastern Massachusetts were found to contain from 26 to 35 parts of iodine per billion. The highest content was in a sample obtained from a bog on a narrow strip of land projecting into Cape Cod Bay. These relatively high figures are consistent with the customary richness in iodine of vegetation near the sea.

Jewish ceremonials and food customs, S. E. Sadow (*Jour. Amer. Dietet. Assoc., 4 (1928), No. 2, pp. 91–98*).—A general discussion of the origin and significance of various Jewish food customs.

Results of dietary and hygienic control of ten non-gaining preventorium children, N. Hord and L. J. Roberts (*Jour. Amer. Dietet. Assoc., 4 (1928) No. 2, pp. 77–85, figs. 2*).—An investigation of the causes of failure to gain of 10 children in a preventorium in Illinois showed that although the diets were qualitatively good the quantitative food consumption was low. Other factors thought to be partly responsible for the failure to gain were insufficient sleep and apparent clinical handicaps such as defective tonsils. An attempt during a four-week period to produce gains in weight by an increase in calories, a more consistent intake of food from day to day, the use of concentrated foods to reduce bulk, and a modification of activity was followed by marked increases in gain in weight over the preceding weeks, the gains being about the same as for an equal number of children who had been making satisfactory gains regularly.

The authors are of the opinion that preventorium work for children who show no tendency to gain under the usual régime is useless unless provision is made for more detailed supervision than is possible with the usual limited staff of a preventorium. "It would seem, therefore, that there should be either a more careful selection of children so as to include only those who have no clinical handicaps and can be expected to thrive on the general preventorium procedure, or that a special dietitian should be added to the staff to take charge of such intensive work with the difficult gainers as has been described."

Malden studies on health education and growth, C. E. Turner (*Amer. Jour. Pub. Health, 18 (1928), No. 10, pp. 1217–1230, figs. 5*).—A statistical study of the growth records over a period of 20 months of 273 children under an organized health-education program in Malden, Mass., and 202 children in a comparable control group without special health training is reported, with the conclusion that "the rate of gain in both height and weight for the children receiving health education was measurably and significantly greater than for the children in the control group." In discussing the data, particularly individual cases, the fallacy is pointed out of emphasizing only the gain in weight in measuring the success of a school health-training program. The corresponding rapid gain in height left many of the children still underweight. Seasonal variations in underweight and wide fluctuations from time to time in the same children were evident.

Cod liver oil as a substitute for cream in feeding mixtures for infants, H. E. Irish (*Jour. Amer. Med. Assoc., 91 (1928), No. 24, pp. 1884, 1885*).—Success is reported in the administration of cod-liver oil to infants as a part of the milk formula, the oil being added to skim milk to the extent of the entire fat requirement. The formula and method of preparing it are described, and data are given on the results of its use in 10 subjects from 4 weeks to 18 months of age at the time the treatment was started. The formula was well taken by children under 10 months of age, with good clinical results and gains in weight in excess of the average for the age.

Basal metabolism of the inhabitants of the Province of Salta [trans. title], P. Mazzocco (*Compt. Rend. Soc. Biol. [Paris], 99 (1928), No. 21, pp. 237, 238*).—Basal metabolism determinations with the Benedict-Roth apparatus have been conducted on 8 men and 7 women of different ages and 61 soldiers 20 and 21 years of age in the Province of Salta, Argentina, where the summer temperature range was from 21 to 28.5° C. (71.8 to 83.3° F.) and the laboratory temperature at the time of the observations from 18 to 24°. Of the entire number of 104 determinations, 71.9 per cent were within ±10 per cent and 93 per cent within ±15 per cent of the Aub and Du Bois standards.

The growth and maintenance of white mice fed upon synthetic diets, M. C. Dawbarn (*Aust. Jour. Expt. Biol. and Med. Sci., 5 (1928), No. 2, pp. 149-169, figs. 11*).—A study of the behavior of mice fed upon various experimental diets is reported, with the recommendation of a diet which has been found satisfactory for normal growth and reproduction through three generations. The diet, which contains 11 per cent less protein and 3 per cent less salt mixture than the one recommended by Beard (E. S. R., 55, p. 292), is as follows: Casein 18, dextrinized arrowroot starch 46, cane sugar 15, butterfat 8, lard 7, salt mixture (Osborne and Mendel 4) 1, agar 2, and moist compressed yeast containing 75 per cent water 15 parts.

The chief drawback to this diet is that the yeast is incorporated in the diet rather than being fed separately, but it was found impossible to secure adequate consumption of the moist yeast when fed separately. The substitution of 4 per cent of yeast dried at 45° C. before incorporating in the diet or 2 per cent of Harris vitamin supplemented by 1 per cent of Harris vitamin in the drinking water gave less satisfactory results. In order to obtain comparable growth with marmite, it was found necessary to use at least 6 per cent. The diet was less satisfactory for females than males. The more satisfactory growth on natural foods could not be attributed to the protein, salt, or vitamin D content. Yeast is suggested as the limiting factor in the experimental diet.

Vitamin A formation: The feeding of etiolated wheat shoots to rats kept in darkness, T. Moore (*Biochem. Jour., 22 (1928), No. 4, pp. 1097–1101, fig. 1*).—Further evidence of the synthesis of vitamin A in the absence of light (E. S. R., 58, p. 87) is reported in growth curves of rats maintained in a darkened room and fed as the source of vitamin A etiolated wheat shoots grown in the dark. The only source of illumination at any time was a small ruby lantern for constant illumination and light through a small ruby glass window at the time of collecting and feeding the wheat shoots.

In two series of experiments the vitamin A-deficient diet was supplemented by radiostol (irradiated ergosterol) and the shoots were fed in amounts of 30 and 15 daily after a preliminary depletion period. A control experiment was run with 30 ungerminated seeds and a final series on the basal diet with no radiostol, but supplemented by 15 etiolated shoots daily. There was no growth response with the ungerminated seeds but resumption of growth with the etiolated shoots at both levels with and without the radiostol. The growth was no more marked with 30 than with 15 shoots

The absorption spectrum of vitamin A, R. A. MORTON and I. M. HEILBRON (*Biochem. Jour.*, *22* (*1928*), *No. 4*, *pp. 987–996*, *figs. 6*).—This investigation has been noted previously from a preliminary report (E. S. R., 59, p. 792).

The assay of vitamin A, K. H. COWARD and K. M. KEY (*Biochem. Jour.*, *22* (*1928*), *No. 4*, *pp. 1019–1025*, *figs. 5*).—Attention is called to other types of response to different doses of vitamin A in animals depleted of this factor than were listed by Hume and Smith (E. S. R., 60, p. 93). The technique followed by the authors is that described by Steenbock and Coward (E. S. R., 57, p. 392), care being taken to supply a sufficiency of vitamin B. Several illustrations are given of a continuous subnormal response to small doses of vitamin A which, however, is not followed by premature slackening of growth as reported by Hume and Smith but continues at a subnormal rate for long periods of time.

Illustrations are also given of individual variations in response to equal doses of the same substance by animals apparently in a similar physiological condition, some showing immediate resumption of rapid growth, others immediate resumption of subnormal growth, and still others a long latent period followed by resumption of normal growth. The latent period is attributed partly, but not wholly, to suspension of growth until pathological conditions have cleared up. The importance of a long test period, 8 weeks or more, in vitamin A tests is emphasized.

"For an assay of the vitamin A content of a substance in this laboratory, three or four rats are used for testing each of several different doses, the lowest of which is expected to be too small for resumption of growth, and the highest probably greater than is necessary for normal growth. A comparison of the whole series of results with those obtained from a similar series on the substance with which the unknown is to be compared gives the desired information as to the vitamin A content of the test material. When rats from our own colony are used, the comparison can be made with about half the number of animals."

Vitamin A deficiency and calcification of the epithelium of the kidney, E. C. VAN LEERSUM (*Jour. Biol. Chem.*, *79* (*1928*), *No. 2*, *pp. 461–463*).—A microscopic examination of the minute deposits in the kidneys of rats suffering from vitamin A deficiency (E. S. R., 58, p. 792) has shown that these are not merely deposits of salts, but are in reality epithelial cells impregnated with calcium. It is suggested that the calculi often found in the bladders of vitamin A-deficient rats originate in these kidney deposits, which are washed into the bladder and there increase in size.

Mucosus organism from suppurative lesions of rat on diet deficient in vitamin A, W. L. BRADFORD (*Jour. Infect. Diseases*, *43* (*1928*), *No. 5*, *pp. 407–414*).—Cultures developed under aerobic conditions from suppurative lesions in the middle ears and nasal turbinates of 50 rats on diets deficient in vitamin A have shown the presence in 21 cases of an encapsulated bacillus of the mucosus group. In 13 normal rats, 3 rats on B-deficient diets, and 9 rats on D-deficient diets, cultures from the ears and nose failed to show the presence of this organism. It is thought that the organism is probably a secondary invader of the mucosa of the respiratory tract, rendered suitable for its invasion by the dietary deficiency.

Further evidence of the complex nature of vitamin B.—I, Evidence that a third factor exists, C. H. HUNT (*Jour. Biol. Chem., 79 (1928), No. 2, pp. 723–731, figs. 6*).—Essentially noted from a preliminary report (E. S. R., 59, p. 688).

The concentration of vitamin B.—IV, On the concentration and the separation of the two components of vitamin B, P. A. LEVENE (*Jour. Biol. Chem., 79 (1928), No. 2, pp. 465–470, fig. 1*).—New rat feeding tests with the vitamin B concentrate prepared by the method described in the previous paper of the series (E. S. R., 56, p. 11) have shown that it contains vitamin F in high concentration, together with a small amount of vitamin G. By heating the concentrate to 135° C., vitamin F is destroyed. It has been found possible to obtain a fraction containing vitamin F free from vitamin G by deaminizing the starting material with nitrous acid before adsorption on silica gel. The technique for the preparation of the concentrate is described in detail, with data on its activity. It is estimated that the ratio of the adsorption of the F and G factors by silica gel is 1 : 30.

The dual nature of water-soluble vitamin B.—II, The effect upon young rats of vitamin B_2 deficiency and a method for the biological assay of vitamin B_2, H. CHICK and M. H. ROSCOE (*Biochem. Jour., 22 (1928), No. 3, pp. 790–799, fig. 1*).—Continuing their attempts to determine separately the content of vitamin F (B_1) and G (B_2) in food materials (E. S. R., 57, p. 789), the authors have discovered that casein purified in the usual manner for vitamin B determinations still contains vitamin G in appreciable amounts. This can be removed by thorough extraction with a 0.05 per cent solution of acetic acid, followed by 50 or 70 per cent alcohol containing about 0.03 per cent of acetic acid. It is stated that on the basal diet free from vitamin G young rats can be maintained for three months or more at practically constant weight, with fair appetitie and no outward symptoms with the exception of the skin symptoms which usually but not always develop after the fifth or sixth week. The most constant of these symptoms are "(1) dermatitis and loss of hair from the eyelids, which may become stuck together; if the eyelids are loosened by bathing with warm water, the eyes, though much sunken, appear to be healthy. (2) Front paws stained with blood, caused by rubbing the inflamed margins of the nostrils; wetting of the lower portion of the abdomen with blood-stained urine. (3) Dermatitis and loss of fur on head, round the nose and mouth, and on the abdomen."

The authors have not observed the irritability in the rats noted by Findlay, nor has there been the loss of appetite which he records. On the addition of vitamin G to the diet there is a rapid response in growth and improvement in the dermatitis.

In the technique now followed for the determination of vitamin G in food materials, young rats are placed upon the basal B-free diet when about 4 weeks of age and weighing from 40 to 50 gm. and are kept together for about 10 days, after which they are placed in separate cages with raised screen bottoms. After 2 weeks a daily dose of 0.1 cc. of Peters' antineuritic concentrate is given. This is generally followed by a temporary increase in weight. After 3 or 4 weeks from the beginning of the experiment the material to be tested for vitamin G is given in graded doses, the standard for comparison being the minimum dose giving an average weekly increase of from 10 to 12 gm.

Some constituents of dried yeast and yeast extracts: Their application in human nutrition, S. G. WILLIMOTT and F. WOKES (*Lancet [London], 1928,* *II, No. 13, pp. 668–673, figs. 2*).—In the experimental work reported, fresh brewery yeast was heated at 98° C. with a 5 per cent saline solution for several hours and the extract cooled and filtered. Vitamin B tests conducted on both the extract and the dried residue showed that the extraction process had removed about four-fifths of the vitamin B of the original yeast. It was found that the residue could be used to the extent of 50 per cent of a ration for rats without toxic effects, and that in that amount it furnished sufficient protein of satisfactory quality. The use of such a dried yeast is recommended in bread making, an amount equivalent to from 2 to 4 per cent of the flour being considered sufficient to furnish more vitamin B than is present in whole-wheat flour. Attention is called to the possible destructive effect upon the vitamins of some chemicals now used in the bleaching of flour.

In the course of the experimental work it was found that potato starch may contain sufficient vitamin B to vitiate the results of vitamin B experiments, but that rice starch is apparently free from it.

A list of 39 references to the literature, dealing chiefly with the vitamin B content of yeast, is appended.

The vitamin C content of fresh and frozen raw winter milk [trans. title], W. Saleck (*Milchw. Forsch., 6 (1928), No. 5–6, pp. 464–486, figs. 8*).—A careful investigation of the relative vitamin C content of raw winter milk obtained from stall-fed cows and of the same milk kept in the frozen state for 3 days is reported, with results indicating that the milk was fairly high in vitamin C and that the loss of this vitamin on standing in the frozen condition was fairly small, though appreciable. The milk was administered by pipette in amounts representing varying percentages of the body weights of the guinea pigs. Of the fresh milk, between 10 and 15 per cent of the body weight proved sufficient, while of the frozen milk slightly over 15 per cent was necessary.

The freezing of raw milk is considered a practical method to employ for the transportation of the milk, particularly when it is to be used for infant feeding.

The determination of the anti-scorbutic value of foodstuffs by Höjer's method, M. Goettsch (*Quart. Jour. Pharm., 1 (1928), No. 2, pp. 168–177, pls. 3*).—A comparison of the customary method of determining vitamin C with the shorter method described by Höjer (E. S. R., 57, p. 295) is reported. It is concluded that with the latter method it is possible to determine the minimum dose for complete protection of any source of vitamin C, but that such variations occur with inadequate amounts that the value of an insufficient dose can not be determined without the use of large numbers of animals. The advantages in the new method are the saving in time and the resulting lessening of danger of deaths from other causes than scurvy. An appendix by K. M. Key gives the details of the technique of the Höjer method.

Vitamin-D and iso-ergosterol, A. van Wijk and E. H. Reerink (*Nature [London], 122 (1928), No. 3078, Sup., p. 648, figs. 2*).—Photometric curves are given of the spectra of (1) a 0.01 per cent alcoholic solution of ergosterol irradiated in such a manner that the absorption in the region of 270 to 300 μμ disappeared and a strong absorption with a maximum at about 247 μμ appeared and (2) of a 0.008 per cent alcoholic solution of isoergosterol. These curves are of similar shape, with the exception of small peaks in the former at wave lengths 262, 250, and 242 μμ. In view of the fact that the absorption spectrum of nonirradiated ergosterol shows two of these bands (262 and 250 μμ), it is suggested that ergosterol has two types of absorption bands connected with different parts of the molecule, and that on irradiation in such a way as to form vitamin D one of these makes way for the characteristic absorption band of isoergosterol. This would indicate that the same part of the molecule is changed on irradiation as is changed in the chemical transformation of ergosterol into isoergosterol. Further points of resemblance are the fact that both vitamin D and isoergosterol remain unchanged by irradiation with ultra-violet light of wave length longer than 270 $\mu\mu$ and are destroyed by light of wave length of about 250 $\mu\mu$.

Reaction of irradiated ergosterol (vitamin D) [trans. title], A. STIIGMANN (*Kolloid Ztschr., 45 (1928), No. 2, pp. 165, 166*).—In this preliminary report a color reaction said to be specific for irradiated ergosterol is described which indicates that vitamin D is an aldehyde or an unsaturated ketone. The reagent is fuchsin decolorized with a slight excess of hydrosulfite, which gives a violet color on the surface with irradiated, and no color with nonirradiated, ergosterol. An alcoholic solution of ergosterol peroxide gives a bluish violet color with the reagent, but only on long standing in contrast with the very rapid reaction with irradiated ergosterol.

The examination of irradiated zymosterol for the presence of vitamin D, E. M. HUME, H. H. SMITH, and I. SMEDLEY-MACLEAN (*Biochem. Jour., 22 (1928), No. 4, pp. 980–986, pl. 1*).—Of interest in this report of unsuccessful attempts to render zymosterol, a sterol associated in yeast with ergosterol, antirachitic by irradiation is the comparison of the minimum dosages of irradiated ergosterol necessary to produce an effect with different rachitic diets. On account of the fact that zymosterol could not be obtained free from ergosterol, duplicate tests were run with zymosterol and irradiated ergosterol in amounts estimated to be the same as present in the zymosterol as impurity.

On the diet deficient in vitamins A and D described by the authors (E. S. R., 59, p. 595) and the same supplemented by 20 per cent wheat embryo as recommended by Soames and Leigh-Clare (E. S. R., 60, p. 95), ash determinations did not differentiate sharply varying dosages of irradiated ergosterol, nor was there a sharp differentiation between the degree of alkalinity of the feces of the control rats and those receiving the irradiated sterols. The inferiority of irradiated zymosterol as compared with irradiated ergosterol was definitely indicated, however.

With the McCollum rachitic diet 3143, a marked effect was produced by a dosage of 1/100,000 mg. of irradiated ergosterol. The feces of the rats receiving varying doses of irradiated ergosterol became alkaline.

A final series of experiments following the method of Rosenheim and Webster (E. S. R., 56, p. 202) with the Sherman-Pappenheimer diet 84 was run, with conclusive results as judged by X-ray examination of the bones. The bones of the controls showed marked rickets. Those receiving 1/20,000 mg. were almost normal, while those receiving 1/5,000 mg. of irradiated zymosterol were indistinguishable from those receiving irradiated ergosterol in amounts equivalent to that present in this amount of zymosterol. The ash content of the dried extracted bones of the rats receiving different doses of irradiated ergosterol was definitely higher in all cases than the controls, but did not differ appreciably for the different amounts.

The effects of irradiated ergosterol in large doses, W. E. DIXON and J. C. HOYLE (*Brit. Med. Jour., No. 3540 (1928), pp. 832–835, figs. 2*).—Irradiated ergosterol was administered in 1 and 2 mg. amounts in peanut oil to young rats on a bread and milk diet, with no harmful results and no appreciable differences in the growth curves from corresponding controls receiving the oil without the ergosterol. In another series of experiments half-grown rats on a supposedly adequate basal diet were given amounts of 11 and 17 mg. daily of irradiated ergosterol in cacao butter. Those receiving the smaller amount showed a steady increase in weight approximating the controls, while those receiving the larger dosage grew very slowly.

On post-mortem examination the spleen and liver weights of the rats receiving irradiated ergosterol were similar to the controls, except in the group receiving the largest amount, these being somewhat atrophied. No pathological lesions were found anywhere except in the urinary tract, where almost without exception calculi composed of calcium phosphate were found. These could not be attributed to lack of vitamin A, as this was supplied in abundance. A suggested explanation is that as the result of excess of vitamin D larger amounts of calcium and phosphate are excreted from the kidney than can be held in solution by the urine. It is also suggested that there may be a greater tendency to the formation of calculi on diets deficient in vitamin A and rich in vitamin D, and that in certain tropical countries where the diet is deficient, but where there is abundant exposure of the body to sunlight, the two factors together may be responsible for the phosphatic concretions in the urinary tract which occur with great frequency among such populations.

Hypervitaminosis through large doses of vitamin D [trans. title], H. KREITMAIR and T. MOLL (*München. Med. Wchnschr.*, *75* (*1928*), *No. 15*, *pp. 637–639*, *figs. 2*).—The authors have fed excessive doses of vitamin D in the form of irradiated ergosterol to large numbers of experimental animals with the following results: White mice fed from 1 to 5 mg. daily died in from 20 to 6 days, respectively, with considerable loss in weight; white rats receiving 5 and 10 mg. daily died after 15 and 10 days, respectively; guinea pigs were able to survive a daily dosage of 30 mg., but on a dosage of 40 mg. died in 40 days and on a dosage of 50 mg. in 36 days; rats died in 28 days on a dosage of 2 mg. daily and in 10 days on a dosage of 10 mg.; cats receiving 5 mg. daily died in 35 days and 20 mg. in 14 days; on doses of 10 and 12 mg. per kilogram daily, dogs died in 41 and 34 days, respectively; and hens were apparently immune, being able to survive daily doses of 50 mg. Marked losses in weight took place in all of the animals succumbing to these excessive doses.

The characteristic post-mortem findings were atrophied spleen and extensive calcium deposits in the arterial walls, heart muscle, stomach walls, lungs, kidneys, and intercostal muscles. Although it is pointed out that these doses were far in excess of the therapeutic dosage, the importance of administering vitamin D in exact dosage is emphasized.

"Hypervitaminosis" and "vitamin balance," L. J. HARRIS and T. MOORE (*Lancet* [*London*], *1928*, *II*, *No. 17*, *pp. 892*, *893*).—This is chiefly a summary of experiments conducted by the authors in an endeavor to answer disputed questions of possible injurious effects of abnormally large doses of vitamin concentrates and of the quantitative relationship between the requirements of the several vitamins.

Doses of irradiated ergosterol in amounts 100,000 times the concentration required for protection against rickets caused rapid loss in weight, followed by death, while similar concentrations of nonirradiated ergosterol and smaller doses of irradiated ergosterol had no deleterious effect. It is suggested that the harmful effects may have been due to impurities in the irradiated ergosterol, but it has been demonstrated that impurities common to the processes of heating and irradiation can not be held responsible.

A dosage of irradiated ergosterol 100 times the normal allowance had no effect upon the time of onset of symptoms due to vitamin B deficiency. Rats on a restricted allowance of vitamin B in the form of marmite grew less rapidly when cod-liver oil was substituted for 15 per cent of inactive peanut oil in the experimental diet. Rats on a vitamin B-deficient diet supplemented by massive doses of cod-liver oil concentrate developed pellagra-like symptoms which were not observed when an adequate supply of marmite was given with the concentrate or when the concentrate was omitted. Normal gestation always failed on diets containing 15 per cent of the cod-liver oil.

In regard to the harmful effect of excessive doses of irradiated ergosterol, it is emphasized that the harmful doses are so greatly in excess of the requirement that there is little practical danger of ill effects from excessive vitamin intake.

"Hypervitaminosis," S. W. F. UNDERHILL (*Lancet [London], 1928, II, No. 18, p. 948*).—In this brief note, occasioned by the above letter of L. J. Harris and T. Moore, evidence is summarized indicating that the toxicity of ergosterol irradiated in a nonvolatile solvent is not proportional to the antirachitic activity, thus suggesting that the harmful effect of excessive doses of irradiated ergosterol is not due entirely to vitamin D. The author is likewise of the opinion that the harmful doses are so greatly in excess of the protective doses that no harm is likely to result in the use of such a vitamin D concentrate. The advisability is urged, however, of standardizing preparations of vitamin D in terms of some stable standard preparation as recommended by Coward (E. S. R., 59, p. 689).

A note on the treatment of rickets with irradiated ergosterol and ultraviolet light, E. F. PRINGLE (*Lancet [London], 1928, II, No. 24, p. 1237*).—Attention is called to the fact that in the treatment of 42 cases of early, medium, and late rickets with radiostol (irradiated ergosterol) there was rapid improvement in the rachitic condition, particularly in the early and medium cases, but that the improvement in the general condition was not as rapid as is customary following irradiation.

Effect of infra-red radiation on growth of rachitic rat, E. M. L. CLAUSEN (*Soc. Expt. Biol. and Med. Proc., 26 (1928), No. 2, pp. 77, 78*).—In this preliminary report, it is stated that a 10-minute daily exposure to near infra-red radiation (ranging from 720 to 1,120 $\mu\mu$) causes increased growth in young rats fed a rickets-producing diet and prolongs the survival period for from 4 to 6 weeks without conferring any protection against the disease. In the limited number of animals thus far examined the growth-promoting effect has been found to be associated with marked enlargement and hypertrophy of the thyroid gland, litter mates irradiated with ultra-violet light not showing this change. Some hyperplasia of the parathyroid gland was also observed in rats exposed to infra-red radiations. Ash analyses of the bones of 18 rats protected against rickets by ultra-violet radiation showed slightly higher ratios between the ash and organic residue than in litter mates receiving in addition to the ultra-violet a daily exposure to near infra-red radiation.

Seasonal variation of the antirachitic effect of sunshine, II, F. F. TISDALL and A. BROWN (*Amer. Jour. Diseases Children, 36 (1928), No. 4, pp. 734–739, figs. 2*).—The investigation previously noted (E. S. R., 58, p. 495) has been completed by similar observations of the effect of sunlight in preventing rickets in rats through the remaining months of the year. From the results obtained throughout the entire year, the authors conclude that in the latitude of Toronto the sun's rays have a slight but definite antirachitic effect from the latter part of October through the first part of February. A sharp increase in this effect takes place about February 15 and continues until about October 15, when there is a corresponding decrease. It is estimated that the antirachitic effect of sunshine during April, May, June, July, and August is approximately eight times as great as during November, December, and January.

The relative antineuritic and antipellagric potency of cow's milk, C. H. HUNT and W. E. KRAUSS (*Jour. Biol. Chem., 79 (1928), No. 2, pp. 733–738, *figs. 4*).—In the experiments reported, use was made of the selective adsorption power of fuller's earth for the vitamin F and G fractions of yeast to obtain concentrates of these vitamins. The fraction adsorbed by the fuller's earth and later removed by barium hydroxide was used as the source of vitamin F. The fraction not adsorbed was autoclaved for 2½ hours at 15 lbs. pressure and then used as the source of vitamin G. The basal diet used in the rat tests for vitamin F consisted of casein 18, starch 64, McCollum salt mixture (185) 4, Crisco 10, agar 2, and cod-liver oil 2 parts and in tests for vitamin G casein 18, whole wheat 25, starch 41, salt mixture (185) 4, Crisco 10, and cod-liver oil 2 parts. Tests were also made with chickens on a basal diet of polished rice 78, casein 16, salt mixture 4, and cod-liver oil 2 parts. The chickens receiving the vitamin F fraction in addition to the basal diet maintained their weight and appeared normal, those receiving the G fraction lost weight and developed polyneuritic symptoms, and those receiving both fractions grew slowly and appeared normal.

In the rat experiments there was no growth on the first of the basal diets and only slight growth for a short time on the second. When the first diet was supplemented by 5 cc. of milk and 1 cc. of the F fraction of yeast there was fairly good growth for about 10 weeks, after which there was a tendency for the growth curves to flatten. With a supplement of 5 cc. of milk and 1 cc. of the G fraction, there was good growth for from 6 to 8 weeks, after which there was a rapid decline, thus showing that the limiting factor in milk is vitamin F rather than G. On the second of the two basal diets, there was good growth with a supplement of 5 cc. of milk alone and excellent growth with 10 cc. Since the wheat of the basal diet furnished vitamin F in abundance, this is further proof that the limiting factor in milk is this vitamin. It is estimated that 25 per cent of wheat furnishes a liberal supply of vitamin F, and that 5 cc. of milk furnishes the minimum of vitamin G for growth.

Blood regeneration in severe anemia, XII, XIII (*Jour. Biol. Chem.*, *79* (*1928*), *No. 2*, *pp. 563–586*).—In continuation of the series previously noted (E. S. R., 58, p. 496), two papers are presented.

XII. *Potent influence of inorganic ash of apricots, liver, kidney, and pineapple*, F. S. Robscheit-Robbins, C. A. Elden, W. M. Sperry, and G. H. Whipple (pp. 563–576).—This is the complete report of the study noted from a preliminary report (E. S. R., 59, p. 295). In addition to the materials listed in the preliminary report, pineapple ash is included. This was found to be only slightly potent for hemoglobin regeneration in contrast with apricot ash, which was very potent. Ash analyses of the various materials gave the following values for copper: Liver 0.0247, kidney 0.0280, and apricot 0.0556 gm. per gram of crude ash. Corresponding figures for iron were 0.0099, 0.0136, and 0.0186 gm., respectively.

XIII. *Influence of certain copper salts upon hemoglobin output*, C. A. Elden, W. M. Sperry, F. S. Robscheit-Robbins, and G. H. Whipple (pp. 577–586).—Data are reported on the effect of copper tartrate or sulfate alone and copper tartrate combined with ferric chloride or zinc chloride on blood regeneration in dogs rendered anemic by repeated bleeding.

The influence of the copper or zinc salts alone was very slight. When combined with iron salts the effect of the copper salt was much more pronounced, but in one or two instances not much greater than with the iron salt alone. The authors are of the opinion that a group of substances rather than one single substance is responsible for the increased hemoglobin production in experimental anemia due to bleeding in dogs.

Treatment of pernicious anemia, R. Isaacs, C. C. Sturgis, and M. Smith (*Jour. Amer. Med. Assoc.*, *91* (*1928*), *No. 22*, *pp. 1687–1690*, *figs. 2*).—Of particular interest from the standpoint of the dietary treatment of anemias in this general discussion of the treatment of pernicious anemia with liver and liver extracts is the statement that liver extract has little or no effect on most secondary anemias, while whole liver may be valuable in other types of blood regeneration than that from pernicious anemia. For this reason it is thought that a correct diagnosis is especially important if the extract is to be used in place of whole liver.

TEXTILES AND CLOTHING

Electrical conduction in textiles.—I, The dependence of the resistivity of cotton, silk, and wool on relative humidity and moisture content, E. J. Murphy and A. C. Walker (*Jour. Phys. Chem., 32 (1928), No. 12, pp. 1761–1786, figs. 13*).—The resistance-humidity and resistance-moisture content relationships were studied for cotton, silk, and wool as single fibers, as short threads, and as the covering of standard insulated wires, and the effect of electrolytic impurities in the textile was determined.

The insulation resistance of any cotton sample appeared to be about 10^{12} times greater at 1 per cent relative humidity than at 99 per cent, and in the range of from 20 to 80 per cent is an exponential function of relative humidity. The rate of change of insulation resistance with relative humidity seemed independent of the form of the sample and of its electrolyte content. A decrease in the electrolyte content of the cotton caused an increase in the general level of resistance, i. e., a displacement of the resistance-humidity curve parallel to itself. The conductance of a cotton thread is equal to the sum of the conductances of the component fibers, and the resistance of a cotton thread is directly proportional to its length. In spite of its fibrous structure cotton appeared to have a fairly definite resistivity, and this resistivity is evidently a power function of the moisture content. Equations are given by which the resistance of a cotton sample can be calculated for any moisture content (or the relative humidities corresponding to it) provided a measurement has been made at a single moisture content. The regular dependence of the resistivity of cotton on its moisture and electrolyte content and the relatively small variation of resistance from one sample to another of the same material suggest that the distribution of moisture corresponds to some regularity in the structure of the textile, e. g., in that of cellulose in cotton.

The insulation resistance of silk and wool samples was also a power function of their moisture contents. The resistivity of silk seemed to depend on its electrolyte content in the same way as that of cotton. The rate of change of resistivity with moisture content was much greater for silk and wool than for cotton, and for a given moisture content the resistivity of silk or wool exceeded that of cotton, although silk and wool are more hygroscopic.

The absorption of acids by wool.—Part I, A summary of the literature, H. Wilkinson and A. G. Tyler (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 8, pp. 241–245*).—This is a review of literature including 42 references.

The action of light on cotton dyed with vat dyestuffs, F. Scholefield and C. K. Patel (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 9, pp. 268–274*).—Certain cases of tendering occurring in the dyeing of viscose and cotton with vat dyestuffs were attributed to light falling on the dyed material during dyeing or before the first wash. In other cases light at this stage produced a change in tint, and, exceptionally, a partial or apparently complete destruction of the dyestuff. Vat dyestuffs liable to these changes and to production of tendering were mainly yellows and oranges. Similar effects were produced by impregnating the dyed material with weak alkaline solutions of hydrogen peroxide and exposing to light. The results obtained appeared to support the view that hydrogen peroxide is an immediate cause in the fading of dyed fabrics, and to explain the diminished fastness of blue dyestuffs when dyed in admixture with yellows and oranges.

On the action of light on dyed colours, F. SCHOLEFIELD, E. HIBBERT, and C. K. PATEL (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 8, pp. 236, 237*).—Further tests (E. S. R., 58, p. 695) showed that products analogous to isatin are produced by the fading of other indigoid colors dyed on cotton, and that with each color studied (Ciba Blue 2B and methylindigo) oxidation is the cause of fading.

Notes on the effect of light on coloured fabric, II, E. HIBBERT (*Jour. Soc. Dyers and Colourists, 44 (1928), No. 10, pp. 300, 301*).—Further evidence (E. S. R., 58, p. 695) was provided from experiments with azoic colors showing the importance of time and condition of exposure as factors affecting the fading of colors and the possibility that the effects produced by light from different sources are due partly to their different heating effects.

Pulping flax straw.—V, Production of pulp by the chlorine process, E. R. SCHAFER and C. E. PETERSON (*Paper Trade Jour., 87 (1928), No. 16, pp. 41–46, fig. 1*).—The present paper reports the continuation of previous work (E. S. R., 59, p. 195) on a semicommercial basis to determine the general character of chlorine flax pulps and their probable applications. Observations from the several tests may be summarized as follows:

The pulps produced by the chlorine process are very easily hydrated and consequently can not be refined after the chlorine treatment. The mechanical processing must be done after the alkaline digestion and before chlorination. The physical properties of the chlorine flax pulps depend largely upon the degree of pulping accomplished in the alkaline digestion. The rawer pulps require proportionately a greater amount of chlorine, and the resulting waterleaf papers are, in general, proportionately more hydrated. The chlorinated pulp produced by a predigestion with sodium sulfite is slightly brighter in color and higher in strength, but more hydrated than that produced by the "sulfate" process (a mixture of caustic soda and sodium sulfite). The strength of chlorine flax papers is generally higher when prepared from the pulps requiring higher quantities of chlorine, whereas the degree of whiteness of the paper is higher with pulps requiring less chlorine. The addition of small amounts of soda wood pulp to the chlorine flax pulp furnish increases the opacity, reduces the hardness, and slightly reduces the strength of the waterleaf paper. While none of the papers produced in this study were in themselves of commercial quality, several indicated the possibility of incorporation of chlorine flax pulps in the furnish of high grade papers. The utilization of flax straw as chlorine pulp evidently depends upon economic conditions.

NOTES

Alabama Station.—Dr. W. H. Pierre, associate soils chemist, has been appointed associate agronomist in the West Virginia Station, where it is expected that he will devote most of his time to research in soils.

California Station.—Dr. Max Kleiber, privatdozent in the Institute of Animal Nutrition in Zurich, Switzerland, has been appointed associate in animal husbandry and will direct the net energy studies to be inaugurated by the division of animal husbandry. For this purpose a respiration chamber is to be constructed in the animal science building recently erected at Davis.

Hawaii University and Station.—The union of the Federal Experiment Station with the university station is provided in a joint agreement recently effected by the U. S. Department of Agriculture and the university. The combined station will be known as the Hawaii Experiment Station and will have as its director John M. Westgate, the present director of the Federal station. The research staff will include all former members of the staff of that station and in addition a number of specialists from the university faculty.

Iowa College and Station.—Dr. A. G. Black of the University of Minnesota will become head of the department of agricultural economics in the college and chief of the agricultural economics section of the station on July 1, succeeding Dr. C. L. Holmes, whose resignation has been previously noted.

Kansas College and Station.—The State appropriations for the biennium ending June 30, 1931, aggregate $2,607,000. This is $125,000 less than for the present biennium, largely because of the policy determined upon by the legislature of authorizing no new buildings at any of the five State educational institutions during the next two years. The appropriations for salaries were increased by $32,450 per annum, or 3.2 per cent of the salary budget, and will provide for both promotions and new positions. There was also an increase of $50,000 per annum for maintenance and an increase of $87,450 to $106,500 for the four substations, mainly for additional improvements and equipment at Fort Hays. New items include $10,000 for a study of shipping fever and $6,000 for remodeling the greenhouses.

A series of varietal tests with gladiolas, dahlias, and peonies is to be begun in cooperation with a number of commercial growers. From 100 to 150 varieties will be compared as to their general adaptability to Kansas conditions, their hardiness, keeping qualities, decorative value, and resistance to diseases and insects. Fertilizer tests will also be undertaken.

Massachusetts College and Station.—A five-year fellowship has been established by a commercial potash organization of New York and Amsterdam for investigations on the relation of fertilizers to asparagus. The work will be carried on at the Market Garden Field Station at Waltham and will be conducted on four different soils types.

Michigan Station.—C. A. Lavis, specialist in sugar beet culture, resigned March 31 to accept a position with the Sugar-Beet Investigations of the U. S. Department of Agriculture and has been succeeded by H. L. Kohls. H. C. Kiebler, research assistant in farm crops, resigned April 1 and has been succeeded by George Wenner.

Mississippi Station.—Work is under way on the new station office and laboratory building, for which an appropriation was made by the last legislature. J. O. Smith has been added to the staff of the Delta Substation as agricultural engineer.

Cornell University and Station.—Two bills have been approved by Governor Franklin D. Roosevelt, one of which provides $150,532 for new activities at the College of Agriculture and the other $5,000 for the College of Home Economics for research on living costs on farms. The work assigned to the College of Agriculture includes investigations on the muck soils of the State in both soil and psychological aspects; the production, storage, and diseases of potatoes; problems involved in regional agricultural adjustments; the operation of city markets and cooperative marketing; aspects of rural government; and a considerable extension and development of the work in animal husbandry, including a new calf barn, extensive alterations in the existing barns, larger maintenance funds, and some additions to the staff. The bill also carries $10,000 additional for printing and provides for another editorial assistant.

This legislation was enacted on the basis of recommendations by an Agricultural Advisory Commission appointed by the governor in December, 1928, and was indorsed by him in a special message to the legislature as representing "the minimum of what ought to be done this year to help the farmer to meet his farm problems."

In addition to these special appropriations under this farm aid program, the regular appropriation bills carry $29,000 additional to be immediately available and a $21,000 increase in general items for next year for the College of Agriculture and $7,950 for the College of Home Economics. Earlier in the session a bill was approved providing $475,000 for the erection of the main central section of the new building for the College of Home Economics.

North Dakota Station.—The legislature has appropriated $289,507 for the station for the ensuing biennium as compared with $303,195 for the present biennium. Among the special items allowed is $15,000 for an increase of the cereal breeding work.

Washington College and Station.—Dr. A. L. Hafenrichter, professor of botany of Baker University of Baldwin, Kans., has been appointed assistant professor of farm crops in the College of Agriculture and assistant in farm crops in the station to give particular attention to forage crops and weeds, and will report for duty June 15. Miss Evelyn H. Roberts has been appointed research specialist in home economics in the station, beginning April 1.

Office of Experiment Stations.—Dr. B. Youngblood, for 17 years director of the Texas Station and for the past 3 years principal economist in the Division of Cotton Marketing of the U. S. D. A. Bureau of Agricultural Economics, has been appointed principal economist and has entered upon his new duties. In his new work he will represent the office in its relations with the stations on matters pertaining to research in agricultural economics. He will give his attention primarily to studying the status of research in this field, the nature of the complex problems presented, and the organization of definite projects to advance their solution. Also, he will give special attention to the progress of current research and to the adequacy of the methods employed.

The appointment of such a specialist in the Office of Experiment Stations is in response to a need, recognized ever since the expansion of activities under the Purnell Act, for a close study of economic problems and procedure and of the means of associating the diverse efforts to make them most effective.

Eriksson Prizes in Phytopathology and Entomology.—Two prizes of 1,000 Swedish crowns ($268) have been offered by the International Committee for Phytopathology and Economic Entomology for the best memoirs giving an account of new and original work in (1) investigations on rust (Uredineae) diseases of cereals (wheat, oats, barley, or rye) and (2) investigations on the rôle played by insects or other invertebrates in the transmission or initiation of virus diseases of plants. The competition is open to all nationalities, but the memoirs must be written in English, French, or German. Three typewritten copies of the memoir must reach the secretary of the committee, T. A. C. Schoevers, Wageningen, Netherlands, by May 1, 1930, and the announcement of awards will be made at the Fifth International Botanical Congress, which is to be held in Cambridge, England, from August 16 to 30 of that year.

New Journals.—*Chinese Journal of Physiology* is being issued quarterly by the Chinese Physiological Society, Peking. Papers are to be published in the fields of physiology, biochemistry, and pharmacology in English, French, or German, with Chinese summary. The initial number consists of the following articles, all of which are in English: The Effect of Starvation and Refeeding on the Intestinal Epithelium of the Albino-Mouse, by T. P. Sun (pp. 1–6); The Pharmacology of Chinese Aconite, T'sao-wu-t'ou, by H. P. Chu (pp. 7–14); Bastard Anise Poisoning and Its Antidotal Measures, by B. E. Read and P. C. Kiang (pp. 15–22); Anesthetic Mixtures of Ephedrine and Procaine with Adrenaline and Potassium Sulphate, by B. E. Read and C. C. Lin (pp. 23–32); The Proteolytic Ferment of Hsiang-kua, *Cucumis melo*, Linn. (Cucurbitaceae), by H. C. Hou and C. C. Chen (pp. 33–36); A Method of Vessel-Anastomosis for Vivi-perfusion, Cross-circulation, and Transplantation, by R. K. S. Lim (pp. 37–50); Observations on the Secretion of the Transplanted Stomach, by R. K. S. Lim, C. T. Loo, and A. C. Liu (pp. 51–62); A Method for Preparing Pure Ephedrine Hydrochloride from *Ephedra equisetina*, Bge., C. T. Feng (pp. 63–68); A Method of Vivi-dialysis, H. Necheles (pp. 69–79); Studies on Denaturation of Proteins.—II, Coagulation by Alcohol, by H. Wu (pp. 81–88); and The Nutritive Value of the Mung Bean, *Phaseolus aureus* Roxb., by E. Tso (pp. 89–96).

Social Science Abstracts, published under the auspices of the Social Science Research Council by Social Science Abstracts, Inc., at 450 Ahnaip St., Menasha, Wis., is being issued monthly along the lines previously indicated (E. S. R., 58, p. 605). The initial number contains 781 abstracts, with an author index and many cross references. The material is classified under the headings of methodological and systematic materials, the latter including as subdivisions human geography, cultural anthropology, history, economics, political science, and sociology.

Rural Business, published under the auspices of the National Federation of Rural Business at 11 South La Salle Street, Chicago, is being issued as a monthly "for the economic advancement of the farmer, banker, and business man of rural America." The initial number contains an account of the formation of the federation and its personnel and a number of original articles, one of which, by R. W. Thatcher, discusses The Future Outlook for Agricultural Research.

Journal of the Kansas Entomological Society is devoted "to entomology in Kansas and to the proceedings of the Kansas Entomological Society," and is being published quarterly by W. Knaus, 119 South Main Street, McPherson, Kans. The initial number is given up largely to A List of the Literature on Kansas Arthropoda, by J. W. McColloch.

Guatemala Agricola is being issued monthly as the organ of the Confederation of Agricultural Associations of Guatemala, 10 Calle Oriente, Guatemala. The initial number contains a discussion of the necessity for a union of agricultural organizations and considerable data on agricultural credit provisions in Guatemala.

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EXPERIMENT STATION RECORD

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The career of Dr. Thomas Burr Osborne, ended by his death on January 29, 1929, personifies in an unusual degree the ideals of scientific research at the agricultural experiment stations. Entering the service of the Connecticut State Station in 1886, Dr. Osborne soon began a study of the vegetable proteins which became the major project of his life work and continued for almost 40 years. In this relatively intricate and difficult field he did a notable work and achieved wide recognition as an outstanding authority. As one who followed his studies closely from the beginning has recently written, "he exemplified in the best sense the courage and perseverance of the investigator, coupled with the skill and creative ability so essential to discovery. His contribution was an unusually large one, and has been very far-reaching in its effects on our thinking and understanding."

Dr. Osborne's entire life was spent in the city of New Haven, where he was born on August 5, 1859. He was graduated from Yale University in 1881 and received the degree of doctor of philosophy from the same institution in 1885. His early interests were in the field of analytical chemistry, and for three years he was an assistant in that subject in Yale.

The enactment by the Connecticut Legislature of a law to protect the dairy industry and the general public from the increasing sale of unlabeled imitation butters made possible an increase in the chemical staff of the State Experiment Station in 1886, and it was in connection with this control work that he was given his original appointment. His service as a routine analyst, however, was brief and was supplemented almost immediately by studies of analytical methods. The report of the station for 1886 includes notes from his pen on the filtration of crude fiber and the filtration and weighing of silver chloride, and in the following year he gave much attention to devising methods of mechanical soil analysis.

The Connecticut State Station had been established with the immediate objective of providing a defense against fraud, but its aim, as stated in the act of incorporation, was "to promote agriculture by scientific investigation and experiment," and the station was not permitted to develop as either an exclusively control station or as one content with the simpler and more immediately useful forms of testing. Largely because of the broad vision and high ideals of those in whose charge its destinies had been intrusted, scrupulous care had been exercised so to organize its inspection service that it would not hamper the progress of research, to rest it at all times on the soundest basis which science could provide, and to develop as far as possible the more fundamental inquiries. Accordingly, in 1888, just as the Hatch Act was coming into operation, Director S. W. Johnson proposed an investigation of the vegetable proteins, and the station report for the following year tersely announced that "much time has been given by Dr. Osborne to a study of the nitrogenous matters contained in the kernels of maize and oats."

In this modest fashion began a series of investigations of outstanding importance. The studies were undertaken at a time when work in this field was known to be much needed, but the opportunity was being neglected. The first serious examination of the vegetable proteins had been instituted in 1860 by Ritthausen, who had demonstrated the occurrence of many diverse forms in the different seeds and indicated some of the difficulties and complexities of the subject. His work had been far from exhaustive, however, and with the contributions of Denis and Weyl the matter had been left in much confusion. Because of its intricacy the subject was being regarded by chemists in general with some trepidation.

Dr. Osborne first directed his attention to a reinvestigation of the matters dealt with by Ritthausen. Utilizing and devising improved methods and working with characteristic thoroughness and care, he was soon able to show that the number of distinctive vegetable proteins is far greater than Ritthausen had supposed. Ultimately pure specimens of the proteins from no fewer than 32 different seeds were prepared, usually by several methods, and comprehensive descriptions formulated. Many of the proteins previously grouped together were found to be distinct substances. Specific designations were thereupon given them, and the use of older terms much restricted. As Vickery and Mendel, two of his former colleagues, have pointed out in a recent tribute in *Science*, "this clarification of the nomenclature has been of immense assistance in bringing a semblance of order into an almost hopelessly confused subject."

This phase of Dr. Osborne's activities continued for about 10 years and led logically to an investigation of the proteins as a group, their structure and their properties. Here again he was delving in a pioneer field, and again he was equal to the occasion. In the words of a resolution of appreciation adopted by the station board of control at his retirement from active service late in 1928, "his mind has always been raising questions which he was able to define with rare precision, and then with equal discernment he has devised means for their experimental investigation and solution." By analysis and reanalysis he patiently and persistently advanced the boundaries of knowledge of the fundamental chemistry of the proteins and established a basis for the third and culminating stage of his research, a study of their nutritive values.

This study was begun in collaboration with Dr. L. B. Mendel in 1909, and involved among other requirements the development of a technique for feeding individual small animals diets containing the pure isolated proteins which he now had available. Unexpected difficulties arose in obtaining normal growth with young animals on what were supposedly adequate rations, but when these were overcome by the use of a "protein-free milk" prepared by removing the casein and lactalbumin from milk serum and evaporating, wide differences in the efficacy of the various proteins were revealed. For example, the animals grew well on wheat glutenin and edestin, but failed rapidly on zein and gelatin, while maintenance but not growth was possible on hordein and rye and wheat gliadin. Further work showed that by the addition of certain amino acids the deficiencies could be rectified and growth made possible.

The great value and immediate practical bearing of these findings were generally recognized, but even more important observations were to follow. These observations grew out of the use of the "protein-free milk" employed in the feeding experiments and indicated that there occurs in butter a substance essential for animal growth. Similar discoveries were reported at about the same time by McCollum and Davis, using an ether extract of egg yolk and of butter, and the essential substance was later designated vitamin A. Subsequently, Dr. Osborne and his associates noted the value of cod-liver oil as a growth stimulant and particularly as the curative agent for the xeropthalmia regularly encountered in the animals receiving the deficient diets.

In 1911 Drs. Osborne and Mendel showed that the "protein-free milk" was much more efficient in inducing growth than was a corresponding mixture of lactose and pure salts or milk ash, thus implying the presence of some water-soluble organic growth-promoting substance. This early inference was later confirmed, and the studies contributed considerably to the development of our knowledge of the distribution of such a vitamin in foods and its significance in normal nutrition, particularly in connection with growth.

Many other extensive contributions were also made, as indicated in the following summary by Vickery and Mendel: "Much labor was devoted to the study of the nutritive value of the proteins of the commercially important foods, and this work gave a rational explanation of many practices which empirical experience had shown to be advantageous. The distribution of vitamins A and B in natural food products was studied, and considerable success was attained in an effort to prepare a vitamin-rich concentrate from yeast. The phenomena of growth, its suppression and acceleration under various regimens, the effect of the individual inorganic constituents of the diet, these and many other topics received attention at different times."

An idea of the extent of Dr. Osborne's labors may be gathered from the fact that a complete bibliography of his publications is said to reach 253 titles, of which about 200 are contributions to journals reporting his personal scientific work. This large number is the more remarkable in view of his conservatism in announcing his findings and his rigid insistence that no result must be made public that had not been verified by careful, thorough, and repeated experiment. Perhaps because of what has been termed his "meticulous editing," none of his published works are of great length, the most extensive probably being his monograph of 154 pages on The Vegetable Proteins, first issued in 1909 and extensively revised in 1924. This monograph and his report of 119 pages on The Proteins of the Wheat Kernel (1907) have long been regarded as classics in their respective fields.

The success of Dr. Osborne's work may fairly be considered a resultant of his personal efforts, characteristics, and qualifications, and his favorable environment. To an unusual degree he represented the "exceptional investigator," of whom much is heard in discussions of research and research workers. He was well equipped by training and temperament to utilize to the full his advantages and to profit by his congenial surroundings. Assigned as a young man to a highly complex and difficult problem, he grew with his opportunity. Beginning in a small way, devising and adapting his tools for the task, he worked logically, patiently, and sanely. Progress was neither spasmodic nor spectacular, but it was steady and sure, with little lost motion and even less of following of blind trails and retracing of steps. Gradually the mosaic was assembled, and the work little understood or appreciated in its beginnings was impressively revealed.

Without detraction from the achievements of the central figure in the execution of this important project, it may be pointed out that much credit also accrues to his associates, his colleagues and coworkers, and especially to those who have formulated and executed the policies of the institution under whose auspices the work has been done. Outstanding among these have obviously been Director Johnson, at whose instigation and under whose enlightened leadership the investigation was originally conceived and gotten under way, and his successor, Director E. H. Jenkins, who without the incentive of project authorship assumed the responsibility for its continuance and suffered no interference with its progress. Nor should there be overlooked the consistent cooperation and support of successive boards of control, manifested through the years when results came slowly and their applications to practical farming seemed remote and improbable. If it is recalled that even after the passage of the Hatch Act the entire resources of the station did not exceed $20,000 per annum for several years, that the experiment station itself was on trial in Connecticut as elsewhere, with its usefulness as an aid to agriculture still to be fully accepted, and that a host of relatively simple problems of undoubted economic importance and popular appeal were pressing for solution, the courage and the vision of Dr. Osborne's supporters become manifest. When the contention is heard, as happens from time to time, that the agricultural experiment stations are too hard pressed for results of practical value and for immediate application to be looked to for systematic and long-time research along fundamental lines, the maintenance of Dr. Osborne's work year after year may well be included in the many instances which may be cited in rebuttal.

From various aspects, the story of Dr. Osborne intrigues the imagination and supplies a unique inspiration. Fortunately it is not only a story with a moral but a tale with a happy ending. Public recognition came slowly, and first of all, according to Vickery and Mendel, by way of Germany, when Griessmayer in 1897 published a treatise on the vegetable proteins that contained many extracts from Dr. Osborne's papers and stated in his introduction that it was his hope " to bring to light these treasures buried in their American publications." By 1904, however, the fundamental character of the work had been so thoroughly established as to enlist substantial financial support from the Carnegie Institution of Washington, and this support has subsequently been continued without interruption as one of the comparatively few projects carried on at an experiment station which have ever received such aid. In 1908 the work was also accepted by the Office of Experiment Stations as an appropriate project under the recently enacted Adams Act, and this relationship likewise continued without material modification for nearly 20 years.

Personal recognition was ultimately accorded in generous measure. Yale University conferred the honorary degree of doctor of science in 1910, and in 1923 appointed Dr. Osborne a research associate in biochemistry with professorial rank. In 1920 he was elected a member of the National Academy of Sciences, in 1912 an honorary fellow of the Chemical Society of London, and in 1914 a fellow of the American Academy of Arts and Sciences, and he was long a member of numerous other societies at home and abroad. For many years he was associate editor of the *Journal of Biological Chemistry*. Three medals were awarded to him, the gold medal of the Paris Exposition in 1900, the John Scott medal in 1922, and (as the first recipient) the Thomas Burr Osborne gold medal established in his honor in 1926 by the American Association of Cereal Chemists in commemoration of his "notable services to cereal chemistry."

Late in 1928 and at his own request, he was relieved of active charge of the biochemical laboratory, at which time he was given the title of consulting biochemist by the board of control, with appropriate resolutions of appreciation. In the few weeks which followed, the memory of these honors and the many expressions of esteem of his colleagues and others doubtless brought him much pleasure, yet the guess may be hazarded that his highest satisfaction came from his own realization that he had achieved the goal of every true investigator, a lifetime profitably and productively spent in the elucidation of a worth-while problem. As Vickery and Mendel have well said, "his death removes one of the great pioneers of American biochemistry, a man whose name will always be linked with the subject he made peculiarly his own."

Bearing the title Some Pennsylvania Pioneers in Agricultural Science, a book has recently appeared which is of unique historic interest. This book was written by Prof. Thomas I. Mairs, a member of the faculty of the Pennsylvania State College for the past 27 years, with the purpose, as he explains in its preface, of putting into available form "information concerning some of the men who laid the foundation of the School of Agriculture and the Agricultural Experiment Station." It was prepared at the suggestion of Dean and Director R. L. Watts "to perpetuate the memory of the men who helped found this State institution," and is dedicated to Mr. Robert H. Garrahan, a prominent horticulturist of the State and a stanch friend of the college, through whose financial assistance its publication was made possible.

The book is in the form of brief sketches of eight pioneer members of the faculty, with a concluding chapter devoted to three early trustees. The octet selected for separate chapters are Drs. H. P. Armsby, W. A. Buckhout, William Frear, and W. H. Jordan, Professors George C. Butz and John Hamilton, Farm Superintendent William C. Patterson, and President William G. Waring. All of these save Jordan, Hamilton, and Waring were members of the station staff on its formation in 1887, and without exception continued their connection with the institution until their death. The trustees included are Messrs. Frederick Watts, Hugh Nelson McAllister, and

Moses Thompson. The author had enjoyed the close personal acquaintance of nearly all of those of whom he writes, and the result is a pleasing series of more or less intimate pictures and reminiscences, supplemented in many cases by extracts from the tributes of others. The aim throughout has been to compile neither a history of the School of Agriculture nor complete biographies of the persons considered, but "to show something of the personal characteristics of the men as well as the part each took in the development of the agricultural activities of the institution."

The potential importance of biographical writings of this sort as an aid in the upbuilding of agricultural education and research is perhaps somewhat greater than is always realized. Fulsome laudation is doubtless of slight value for this purpose, but a discriminating evaluation of the past, an analysis of its successes and failures and the reasons therefor, should usually bring both enlightenment and inspiration. It is said of Dr. Armsby, for example, that "he studied carefully, impartially, and thoroughly what other men had done in his line of work, and on that foundation sought for new truth." This is the traditional attitude of the investigator, but the method is capable of wider application. Agricultural education and experiment are not mere abstractions, but have become everyday realties as they have functioned through men and women. History and psychology can not safely be neglected by the prospective teacher and investigator, for the receptive mind can learn much by consideration of the human element which is so large a factor in our institutions. As the successive generations rise and pass away, we need to know more of the pioneers and later leaders, the conditions under which they labored, and the contributions to progress which they made. At nearly all of the agricultural colleges and experiment stations there is still opportunity for service by making permanently available information along these lines, and this opportunity may be profitably availed of in increasing measure before it becomes too late.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The mineral content of feeds, soils, and waters of South Carolina, J. H. Mitchell, J. D. Warner, and K. S. Morrow (*South Carolina Sta. Bul. 252 (1928), pp. 32; abs. in South Carolina Sta. Rpt. 1928, pp. 36–38*).—The elements determined were iron, calcium, magnesium, phosphorus, and iodine in the soils and waters examined, and, in the feedstuffs, moisture and ash in addition to the elementary determinations mentioned. The plant material was collected from plats of known fertilizer treatment and located at Clemson College, Gaffney, Trenton, Bishopville, Florence, and State Park. This material was taken at the hay-cutting stage of growth and was preserved air-dried. Oats, soy beans, grass hay, winter field peas, cowpeas, rye and vetch, clover, lespedeza, etc., were included among these samples.

The soil samples were collected at the three depths of 0-6, 7–12, and 13–18 in. and were held for analysis in the air-dried condition. From city water supplies samples were taken from the natural supply and from the purified water. In addition to these samples eight river waters and two well waters were examined.

Detailed analytical results are assembled in three appendixes, of which the first is designated to show the effect of lime on the calcium, magnesium, and phosphorus contents of the plant; the second, to demonstrate the effect of phosphorus as a fertilizer upon the phosphorus content of the plant; and the third, to show the average composition of feedstuffs grown on soils under known fertilizer treatment in comparison with the soil analyses in the three layers above mentioned.

An investigation of the method of Page and Williams for the determination of the saturation capacity of soils, P. E. Turner (*Jour. Agr. Sci. [England], 18 (1928), No. 2, pp. 257–265*).—Various methods of determining the saturation capacity of soils are discussed, particular attention being given to that of Page and Williams (E. S. R., 54, p. 316) for the estimation of the state of saturation of the soil when in equilibrium with calcium carbonate. Defects of the method are pointed out, the chief of these being the slowness with which the reaction proceeds to completion. "In view of this, it is recommended that 3 liters or more of filtrate be obtained, or, preferably, the amount of soil employed be reduced to 10 gm." It was found that "the variation in the character of the colloidal material of soils is to some extent reflected in the value of the ratio of the calcium passing into solution through exchange reactions in the second liter to that dissolved in this manner by the total volume of filtrate." It is stated that the incompleteness of the reaction renders the method of Hissink (E. S. R., 50, p. 118) inaccurate for the calculation of saturation capacity.

The determination of exchangeable calcium in carbonate-free soils, R. Williams (*Jour. Agr. Sci. [England], 18 (1928), No. 3, pp. 439–445*).—It was found that acetic acid is a suitable reagent for extracting exchangeable calcium from carbonate-free soils, and a method using 0.5 N acetic acid is described.

Dye adsorption by hydrous alumina in soils, H. H. Croucher (*Jour. Agr. Sci. [England], 18 (1928), No. 2, pp. 350–362, fig. 1*).—"A procedure for the detection of hydrous alumina in soils is described, involving the demonstration of the isoelectric point of hydrous alumina by means of preferential dye adsorption in suspensions of various pH values. Satisfactory results were obtained with a mixture of acidic Biebrich scarlet and basic iodine green. The former is adsorbed by hydrous alumina only on the acid side of its isoelectric point, and the latter only on the alkaline side. . . . The applicability of the mixture of dye-stuffs finally selected is demonstrated for a series of soils of varying basic ratio, and including examples of lateritic soils and clays."

Chemical studies of grape pigments, II, III, R. S. Anderson and F. P. Nabenhauer (*New York State Sta. Tech. Bul. 146 (1928), pp. 21*).—These two papers have previously been noted from another source (E. S. R., 52, pp. 610, 803).

METEOROLOGY

Influence of crop plant cover on meteorological conditions [trans. title], M. M. Sambikin (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 4 (1927), No. 12, pp. 830–844, figs. 4; Ger. abs., p. 844*).—It is pointed out that conditions within or near the plant cover may be quite different from those at levels or places unaffected by the cover. It is stated that reliable conclusions regarding the relation of meteorological conditions to crop growth can be drawn only from observations made in close proximity to the crops. The plan for observations on the diurnal course of the meteorological elements during the growing period of crops, which were begun at the Poltava Experiment Station in 1927, is described.

The necessity of measuring the heat of soils in the course of field and greenhouse experiments [trans. title], P. I. Andrianov (Andrianow) (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 4 (1927), No. 12, pp. 819–828, figs. 5; Eng. abs., p. 828*).—The importance of measuring soil temperature as well as moisture in experiments with plants is pointed out, and a mercury thermometer and an electrical resistance thermometer for this purpose are described.

Climatological data for the United States by sections, [September–October, 1928] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 15 (1928), Nos. 9, pp. [195], pls. 3, figs. 3; 10, pp. [195], pls. 3, figs. 2*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for September and October, 1928.

Weather reports, H. W. Alberts et al. (*Alaska Stas. Rpt. 1927, pp. 6, 14, 15, 24, 29–40*).—Monthly summaries of temperature, precipitation, and cloudiness recorded at 45 places in Alaska are given for the calendar year 1927, with brief notes on the seasonal weather conditions and their effect on crops at the different experiment stations.

At the Sitka Station "the season was favorable for the growing of vegetables, hardy flowers, and some fruit, including berries, apples, and cherries. The average temperature for the winter was considerably lower than that of last year. Frequent alternate freezings and thawings during the winter and spring months caused heaving of the surface soil at the station."

At the Kodiak Station the maximum temperature during the growing months of June, July, and August was 62° F., the minimum 37°. "The mean temperature was 57°, or only 15° above the minimum required for crop growth."

The weather at the Matanuska Station "was not so favorable to plant growth as in some other years. Severe weather for two weeks in the late fall of 1926, when the thermometer ranged from +20 to −6° F., caused the ground to freeze deeper than usual. A 12-in. snowfall on December 9 and 10 was followed by frequent light falls during January, February, and March. The snow remained on the ground until April 18, 1927, and retarded the season. March had a mean temperature of 3° and April of 6° less than for the 9-year average. Normal temperatures followed in May and June, but the precipitation was below normal. Vegetation was slow in starting into growth because of the cool weather late in the spring. As a result of the late thawing there was sufficient moisture in the ground to carry most of the crops over until July 15. . . . Killing frosts between September 11 and 16 stopped the growth of all crops except roots, hardy peas, and grasses."

Crop yields at the Fairbanks Station "were reduced by the drought. The total precipitation for June, July, and August was only 2.6 in. . . . The summer mean temperature was 5° above normal. The last killing frost in the spring occurred May 27 and the first killing frost in the fall September 1, the frost-free period lasting, therefore, 96 days."

Meteorological observations at the Massachusetts Agricultural Experiment Station, C. I. GUNNESS and L. O. JONES (*Massachusetts Sta. Met. Buls. 479–480 (1928), pp. 4 each*).—The usual summaries are given of observations at Amherst, Mass., during November and December, 1928. The December number gives an annual summary, from which the following data are taken:

Mean pressure 29.997 in.; mean (hourly) temperature 47.4° F., highest 93° July 8, lowest —3.5° January 30 and February 26; total precipitation 42.06 in., snowfall 30 in.; cloudiness 2,253 hours; bright sunshine 2,201 hours (49 per cent); prevailing direction of wind, southwest; total movement 57,215 miles, maximum daily 544 miles January 25; last frost in spring May 14, first in fall September 25; last snow April 28, first November 8.

Meteorological report for 1927, E. BURKE (*Montana Sta. Rpt. 1927, pp. 96–98*).—Observations on temperature, precipitation, evaporation, relative humidity, wind, and sunshine at Bozeman, Mont., are briefly summarized.

The mean temperature for the year was 40.6° F.; the highest temperature 89°, July 19, the lowest —33°, December 31. The last killing frost in spring occurred May 18, the first in the autumn September 15. The total rainfall was 21.84 in. The evaporation from April 1 to October 30 was 35.57 in. Precipitation was above normal during the growing season. This reduced evaporation, and "added to the value of moisture in the soil and lessened the amount of water necessary for irrigation. The rapid rate of evaporation and the low relative humidity for October made the month ideal for threshing grain and curing hay."

Meteorological report for 1927, F. E. HEPNER (*Wyoming Sta. Rpt. 1928, pp. 167–169*).—The usual summaries are given of observations on pressure, temperature, precipitation, wind, and sunshine at the University of Wyoming, Laramie. The mean pressure for the year was 23.06 in. The mean monthly temperature was 41.6° F., the highest 86° July 17, the lowest —20°, December 7. The last killing frost in spring occurred May 30, the first in autumn September 20. The total annual precipitation was 10.85 in. The number of clear days was 117. The average temperature for the year was about 1° above normal. The total precipitation for the year varied little from the normal, and for the growing season was only slightly below the average.

SOILS—FERTILIZERS

Principal features of distribution of soils and vegetation in the United States, D. G. VILENSKY (*Soil Research, 1 (1928), No. 2, pp. 108–137, figs. 13*).—This is a general account based on observations made during the transcontinental tour of the First International Congress of Soil Science, dealing with orography, climate, and vegetation.

Alpine agronomy applied to the study of the formation of arable soils [trans. title], L. RIGOTARD (*Compt. Rend. Acad. Sci.* [*Paris*], *187* (*1928*), *No. 4*, *pp. 249–251*).—The author concludes from studies of soils of the mountains of Dauphiné that the physical and chemical properties and the agronomic quality of such soils are greatly influenced by their geological origin and may be classified on the basis of their geological derivation. Plains soils, on the other hand, are more complex, and geological influences are not so obvious in their formation.

The vegetation, soils, and agricultural value of the Chizhinsk flood lands [trans. title], I. V. LARIN (*Akad. Nauk S. S. S. R., Mater. Osob. Kom. Issledov. Soiūzn i Avton Respub., No. 2* (*1926*), *pp. 152, pls. 6, figs. 14.*) The author describes (1) the physicogeographical peculiarities of the region, (2) the flora, (3) the soils of the spotted watershed steppe, of the meadows which are covered at times with water during the spring floods, and those which are yearly flooded, and (4) the salt lakes and the type of soils around them. The morphological characters of a great number of soil profiles, primarily solonetz, are described in detail. Soil and floral maps are appended.

Soil profile in the eastern Gezira, H. GREENE (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 3*, *pp. 518–530*, *fig. 1*).—In a study of soil profiles on the Gezira Research Farm, it was found that "the distribution of salts in the soil is generally related to compactness of the soil profile as judged by the distribution of gypsum, of calcium carbonate aggregates, and of soil color. The relation already established between salt content and fertility is now expressed as a relation between compactness of profile and fertility. The data agree well with geological views as to the origin of this soil. Influences of which the soil profile is the product are also discussed."

A soil boring apparatus, H. GREENE (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 3*, *pp. 515–517*, *figs. 2*).—A soil boring apparatus capable of taking samples in tenacious clays to a depth of 6 ft. is described. The apparatus may be used on small plats without damaging the crop or unduly disturbing the soil.

An index of soil texture, F. HARDY (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 2*, *pp. 252–256*).—"A procedure is described for evaluating an 'index of texture' (*I. T.*), based on determinations of moisture contents at the point of stickiness (*P*), and of sand contents (*S*) of soil samples.

$$\left(I.\,T. = P - \frac{S}{5}.\right)$$

The procedure is simple and allows of a rapid laboratory examination of a great number of spot samples, so that detailed texture maps can readily be constructed."

Dependence of the stability of soil structure on its adsorptive complex and silt content [trans. title], A. F. TIŪLIN (A. T. TIULIN) (*Predural.* (*Perm.*) *Oblastn. Selsk. Khoz. Opytn. Sta., Rezult. Rabot Agrokhim. Otd.* (*Cis-Ural. Region Agr. Expt. Sta. Perm, Dept. Agr. Chem., Results Invest.*), *No. 2* (*1928*), *pp. 1–24, figs. 4; Eng. abs., pp. 22–24, fig. 1; abs. in Deut. Landw. Rundschau, 3* (*1929*), *No. 1, pp. 19, 20*).—From studies made with chernozem and podzol soil, the author concludes that the stability of the soil structure depends directly upon adsorptive capacity and inversely on the silt content, and can be quantitatively expressed by the formula

$$\frac{\text{Per cent of silt (0.01 to 0.005 mm.)}}{\text{Adsorptive capacity}}$$

This formula is based on the fact that colloids saturated with calcium and magnesium are positive factors and silt is a negative factor in structure stability. Treating soils with sodium acetate increased the proportion of colloid clay, while treatment with ferrous sulfate produced the opposite effect.

Aggregate analysis as an aid in determining soil structure [trans. title], A. F. TIŪLIN (A. T. TIULIN) (*Predural. (Perm.) Oblastn. Selsk. Khoz. Opytn. Sta., Rezult. Rabot Agrokhim. Otd. (Cis-Ural. Region. Agr. Expt. Sta. Perm, Dept. Agr. Chem., Results Invest.), No. 2 (1928), pp. 77–122, pl. 1, figs. 15; Eng. abs., pp. 119–122; abs. in Deut. Landw. Rundschau, 3 (1929), No. 1, p. 19*).—This article, supplementing that noted above, deals mainly with a new method of studying soil structure based on determination of soil aggregates, which are divided into two groups, (1) true aggregates cemented by irreversibly flocculated gels (Ca, Mg) and (2) false aggregates cemented with reversibly flocculated gels or simple suspensions. Aggregates of the first group may be determined by washing with water through sieves of different diameters or by the Robinson method (E. S. R., 49, p. 316). Aggregates of the second group may be determined by sieving in dry condition and then treating the separates with benzol as in the Robinson method. This gives the total aggregates, and the aggregates of the second group can be determined by difference. There was found to be a qualitative relation between structure stability based on aggregate analysis and productiveness of the soils. The deterioration of tilth in soils is also reflected in differences in structure shown by aggregate analysis.

Soil permeability in the eastern Gezira, II. GREENE (*Jour. Agr. Sci. [England], 18 (1928), No. 3, pp. 531–543, figs. 5*).—Studies of soil moisture on the Gezira Research Farm confirm Joseph's view (E. S. R., 55, p. 21) that "the relation between salt content and fertility is chiefly due to the effect of sodium salts on soil texture." Marked improvement in the permeability of the soil was brought about by applications of gypsum.

The specific conductivities of soil extracts, C. H. WRIGHT (*Jour. Agr. Sci. [England], 18 (1928), No. 2, pp. 186–193, figs. 2*).—Data are presented to show that the specific conductivity of a water extract of soil (1:5) determined by the Kohlrausch method is an index of the fertility of the soil. Although "considerable differences were found in the specific conductivities of different soils at any one time of the year, and considerable differences in any one soil at different times of the year, the specific conductivities being highest in March and lowest in June and July," a relation was found "between the specific conductivities of the soil extracts and the mean weights of lint per plant per row in the case of two strains of Ishan cotton." Evidence was obtained that specific conductivity and rate of solution decrease with continuous cultivation.

The usefulness of capillary potential to soil-moisture and plant investigators, L. A. RICHARDS (*Jour. Agr. Research [U. S.], 37 (1928), No. 12, pp. 719–742, figs. 7*).—The application to the study of soil moisture of capillary potential as first proposed by Buckingham and Cameron (E. S. R., 18, p. 820) and developed by Gardner (E. S. R., 44, p. 316; 45, p. 21) is explained.

"It is shown that, when the proper units are used, the value of the capillary potential in soil which is in moisture equilibrium with water through a porous clay wall is numerically equal to the difference in pressure in the water and atmospheric pressure. The capillary potential is therefore a measure of the pressure in the soil solution. . . . The flow of moisture through soil can be expressed as simply the capillary conductivity times the potential gradients, i. e., $v = -K \text{ grad } \Phi$. . . . Application of the potential theory to soil-moisture movement is made for the following cases: (1) Flow of moisture downward through soil after rainfall or irrigation, (2) flow of moisture upward from a saturated water table, and (3) movement of moisture in a horizontal direction."

It is stated that capillary potential is a direct measure of the availability of soil water to plants, as determined by the "security" with which the water is held by the soil and the readiness with which moisture flows in to replace that used by the plant. "The rate of moisture flow toward the roots is quantitatively expressed in terms of the transmission constant and potential gradient by the above equation." A new form of porous clay apparatus which can be used in controlling the water supply of potted plants is described.

A considerable bibliography of the subject is appended.

Weeds and their value as indicators of soil reaction [trans. title], K. Steyer and G. Eberle (*Arb. Biol. Reichsanst. Land u. Forstw., 16 (1928), No. 2, pp. 325–422, pls. 5, figs. 12; abs. in Deut. Landw. Rundschau, 3 (1929), No. 2, pp. 132–134*).—From results of extensive studies of the distribution of various weeds as related to soil reaction, which are reported in detail, it appears that *Scleranthus annuus* is especially suited to serve as an indicator of soil reaction, the plant being most abundant in areas having a soil reaction of pH 5.1 to 5.6 and occurring to a very limited extent in soils having a hydrogen-ion concentration of pH 5.7. Very definite correlations of other plants with varying ranges in soil reaction are also indicated. The weed flora was found to be relatively constant from year to year, and may therefore furnish a basis for a practical method of diagnosing soil reaction. A bibliography of 115 references to literature bearing on the subject is given.

A fundamental study of the mechanism of buffer action in soils, P. B. Myers and G. M. Gilligan (*Delaware Sta. Bul. 158 (1928), pp. 17, 18*).—A study under this head of the colloidal material isolable from Portsmouth loam, noted from the preceding annual report (E. S. R., 58, p. 416), has now been extended to include Chester loam, and the beginning of similar work on a Sassafras silt loam is noted. A résumé of the methods employed in the isolation of the colloidal components of these soils and of electrodialysis of the redispersed colloid is given.

In a comparison of certain of the results with the Portsmouth and the Chester loams it was observed that, although the electrodializable contents of the two soils were about the same, yet the completion of electrodialysis of the Chester soil, described as of an inorganic nature, required 113 hours as against but 10 hours for the 90 per cent organic Portsmouth soil. "A soil rich in organic matter evidently gives up its plant food much more readily than does one with little organic matter."

Studies on soils which bear on sedimentation, H. H. Bennett (*Natl. Research Council, Reprint and Circ. Ser., No. 85 (1928), pp. 80–83*).—This is a brief statement regarding the work of the Bureau of Chemistry and Soils of the United States Department of Agriculture, especially on soil erosion as related to sedimentation.

A summary of the activity of bacterial agencies in sedimentation, G. A. Thiel (*Natl. Research Council, Reprint and Circ. Ser., No. 85 (1928), pp. 61–77*).—This summary, with numerous references to the literature of investigations on the subject, deals with bacterial activity at the source of sediments, other mineral alterations in mantle rock, biochemical decomposition in carbonaceous sediments, formation of calcareous sediments, and iron-bearing, manganese-bearing, copper-bearing, and sulfur-bearing sediments, and is of interest with reference to formation and changes in soils. Various problems for further research are suggested.

Soil bacteria and fertility, P. H. H. Gray (*Sci. Prog. [London], 23 (1929), No. 91, pp. 444–456, figs. 2*).—This is a brief critical review of conditions affecting the accuracy of methods of studying the bacteria of soils and especially their relation to soil fertility. Attention is called particularly to a new technique (noted below) for counting bacteria in stained films of soil, recently developed at Rothamsted, "which eliminates the need of having a known weight or volume of soil on the slide, allows of an accurate estimation of error, and it therefore becomes possible to count with certainty the number of bacteria in parallel samples of soil and also to estimate the fluctuations of the population in time."

The estimation of bacterial numbers in soil by direct counts from stained films, P. H. H. Gray and H. G. Thornton (*Nature* [*London*], *122* (*1928*), *No. 3072, pp. 400, 401*).—A method is described in which certain difficulties encountered in the Conn and Winogradsky methods (E. S. R., 58, p. 119), particularly that of determining accurately the mass of soil in the film examined and the implied assumption that the bacteria are distributed at random over the film from which sample fields are taken, are avoided by "determining, in random microscope fields from a parallel series of stained films, the ratio between the number of bacteria and the number of particles of indigotin, a counted suspension of which has previously been added to a given mass of the soil. The ratios thus obtained from parallel fields are found to be distributed at random, and the bacterial numbers calculated therefrom are of course independent of the amount of soil in the film."

[Soil bacteriology studies at the Delaware Station], T. F. Manns (*Delaware Sta. Bul. 158* (*1928*), *p. 43*).—The work of the previous year on the activation of sulfur oxidation in composts of sulfur, rock phosphate, and soil (E. S. R., 58, p. 420) is reported as still in progress. Certain sulfates are said to have accelerated markedly the oxidation of sulfur in a Sassafras loam. "Whether these activators can be made of commercial importance is a matter of further laboratory and field experimentation."

A study of the effects of the carbonates of calcium, magnesium, sodium, and potassium upon the soil flora is said to have shown "that the cation has a much greater influence on the several groups of the soil flora (ammonifiers, azotofiers, and Actinomycetes) than does the soil reaction, providing the range of the reaction is within the common range of agricultural soils, that is between pH 6 and pH 8."

Investigations on the influence of plant growth on the bacterial life of soils [trans. title], U. Creuzburg (*Landw. Jahrb.*, *68* (*1928*), *No. 1, pp. 75–115, figs. 2; abs. in Deut. Landw. Rundschau, 3* (*1929*), *No. 1, pp. 20, 21*).—In pot experiments with wheat, rye, oats, lupines, peas, and vetch, grown on a sandy humus loam of decidedly acid reaction, it was found that both the total bacterial count and the number of radiobacter cells were greater under the legumes than in bare soil or in soils under the cereal crops. The nitrate content of the soils bearing legumes was distinctly higher than in the soils under cereals, especially after the plants had been harvested. The influence of the legumes was evident in the increased yield of buckwheat following them as compared with that following the cereals. The effect of green manure in increasing the yield of the buckwheat was more pronounced in the case of soils which had previously grown cereals.

Influence of lime nitrogen on the bacterial life in the soil [trans. title], J. Kuhn and O. Drechsel (*Ztschr. Pflanzenernähr., Düngung u. Bodenk.*, *7* (*1928*), *No. 3, B, pp. 105–118, figs. 9; abs. in Deut. Landw. Rundschau, 3* (*1929*), *No. 1, p. 21*).—From experiments on sandy, loam, and clay soils extending over a number of years, the authors conclude that lime nitrogen has a specific effect in increasing bacterial activity in soils, this effect being greater in neutral and alkaline soils than in acid soils.

Nitrogen fixation by soil microorganisms, P. G. Krishna (*Jour. Agr. Sci. [England], 18 (1928), No. 3, pp. 432–438*).—As a result of studies with various culture media inoculated with different soil organisms, the author concludes that the Azotobacter and *Bacillus amylobacter* groups are the important nitrogen fixers in the soil and that fungi are responsible for the fixation of very small quantities of nitrogen. "*B. amylobacter* is able to fix from 4 to 5 mg. of nitrogen per gram of dextrose consumed. *B. amylobacter* has an optimum range of pH between 6.0 and 7.0, and Azotobacter between 7.0 and 8.4. Azotobacter utilizes the organic acids produced during the fermentation of dextrose as sources of energy for nitrogen fixation in the absence of dextrose. *B. amylobacter* does not, or does only to a limited extent, utilize such products. Large quantities of dextrose do not favor an efficient nitrogen fixation, as large quantities of the organic acids produced effect the reaction of the media rendering the organisms inactive. The nitrogen fixing organisms seem to be equally well represented in the heavy and light soils."

The ammoniacal nitrogen of peats and humus soils, Part II, J. C. B. Ellis and C. G. T. Morison (*Jour. Agr. Sci. [England], 18 (1928), No. 2, pp. 346–349*).—In studies in continuation of those previously noted (E. S. R., 36, p. 612) it was found that drying peat caused considerable changes in the amount of ammoniacal nitrogen removable by distillation with magnesia under reduced pressure and increased the relative amount of ammonia extractable by water.

Nitrate reduction by plant roots [trans. title], **A. Shmuk (A. A. Schmuck)** (*Nauch. Agron. Zhur. (Jour. Landw. Wiss.), 4 (1927), No. 3, pp. 155–170, figs. 3; Ger. abs., pp. 169, 170*).—Investigations are reported which show that microorganisms of the *Bacterium coli* group find especially suitable conditions for growth and for nitrate reduction accompanied by nitrite formation in the root substrata and root substance of certain plants, especially cereals. The organisms grow at the expense of the root secretions and the dead root material of the plants, and produce in the root zone a higher concentration of nitrites and acids and a lower nitrate concentration. The optimum temperature for the growth of the organisms was found to be 38 to 39° C., and the optimum H-ion concentration pH 7.35 to 8.3 in phosphate mixtures and pH 7.1 to 8 in borate mixtures. Growth and nitrate reduction were increased by adding phosphate ions much in excess of the nutritive requirements of the organisms. The organisms developed under anaerobic conditions, and free admission of air checked nitrate reduction.

On the significance of hydrogen-ion concentration for the cycle of nitrogen transformation in the soil, C. Olsen (*Compt. Rend. Lab. Carlsberg, 17 (1928), No. 8, pp. 21, figs. 3; abs. in Nature [London], 123 (1929), No. 3091, p. 144*).—Working with a strongly acid humus soil adjusted and maintained at different degrees of hydrogen-ion concentration with quicklime, the author found that "ammonification can proceed in soil whose pH value lies between 3.7 and 9.0, and that this process proceeds most actively in soil whose pH value lies between 7.0 and 8.5. Nitrification can proceed in soil whose pH value lies between 3.7 and 8.8. When the soil is found to be rich in ammonia, the activity of the process increases from a value of 3.7 with the increasing pH value of the soil to a pH value of 8.3, at which the process has its optimum. From here the activity of the process decreases very sharply with rising pH values of the soil. In soil whose pH value lies between 4.0 and 8.0 nitrification will under natural conditions generally be limited by ammonification, and therefore the rate of the latter process will determine the rapidity of the process of nitrification." The results indicate that there may be in soils different races of nitrifying organisms, each with its special pH optimum, or that the organisms are capable of adjusting themselves to wide variations of pH value.

[Soil investigations at the Connecticut State Station] (*Connecticut State Sta. Bul. 298 (1928), pp. 129–131, fig. 1*).—In the growing of two crops of tobacco and one of oats in the greenhouse on 24 soils, "tobacco has proven to be an ideal crop to reveal differences in the availability of the several plant nutrients contained in the soil." Marked deficiencies in potassium were demonstrated in 22 of the 24 soils, and 20 of the soils "exhibited more or less pronounced lack of available phosphorous." It was observed also that "none of the soils were able to supply sufficient nitrogen for normal growth of tobacco, although some contained as high as 10,000 lbs. of total nitrogen per acre."

On two very acid soils (pH 3.9–4.0) where the acid reaction was associated with abnormally high concentrations of soluble manganese and aluminum, "tobacco showed abnormal growth." With these exceptions, there was little response of the tobacco crop to liming, even in soils having pH values as low as pH 4.6.

In an examination of certain forest soils with a view to ascertaining the soil factors which have a definite relation to Connecticut silvicultural practice, several soils were found of which the pH values were as low as 3.2.

Soil fertility investigations (*Oregon Sta. Bien. Rpt. 1925–26, pp. 67–72, 73*).—Rotation experiments yielded 26 bu. per acre in continuous grain (winter barley), 58.75 bu. per acre in grain following clover and potatoes, 72.5 bu. per acre in grain after vetch and potatoes, and 75 bu. following two crops of clover and one of corn. In connection with fertilizer experiments noted, it is stated that of at least $500,000 estimated as now spent annually for fertilizers one-third is being wasted by improper use, and that "on some of the older trials none of the treatments employed proved profitable."

A study of the availability and utilization of phosphorus in soils of high iron content was made with the result, among others, that the phosphorus content of the soil solution was found to be very small and to be but little affected by treatments with sulfur and with calcium carbonate by means of which a reaction range of pH 5.1 to pH 7.2 was secured. "Additional series of this soil [red hill] were treated with monobasic calcium phosphate for their absorptive capacity. The results show that for the entire range of reactions the absorptive capacity is high and takes place very rapidly," as much as 20 parts per million having been added but entirely absorbed by the soil. "This would indicate that where soluble phosphate fertilizers are added to these soils it is immediately precipitated, but is more available for crop use in this state for some time, as shown by field and greenhouse trials."

Summarized results of sulfur experiments include the observations that for typical Oregon soils grinding to 20-mesh fineness is sufficient; that ordinary field applications improve the reaction of arid soils for alfalfa, liberating calcium and other bases, and providing a more favorable concentration of sulfate in some soils; and that sulfur increases the protein and chlorophyll content of alfalfa. At the Vale experiment field also sulfur proved effective in the flocculation of heavy alkali land and in improving the reaction, and on arid lands a little sulfur appeared to benefit the nitrifying bacteria although larger additions inhibited nitrification. Small quantities of calcium sulfate were also found useful under similar conditions.

Potassic fertilizers were profitable on residual soils in the Deschutes Basin for crops drawing heavily upon this element, potassium sulfate being "a preferable form for that section due to the value of the sulfate residue for legumes."

Note is made of nitrogen experiments leading to the belief that the use of legumes is "a more constructive and profitable treatment than the application of commercial nitrates, except as a starter, where rainfall or irrigation makes it possible to obtain this element . . . by means of nitrifying bacteria and legumes."

In the work on soil acidity and liming here noted, it was observed that "certain very acid soils of western Oregon have been largely exhausted as to replaceable bases," and optimum growth reaction for a number of crop plant species was determined.

From a study of organic manures it was concluded that "the reduction of grain straw to manure by the use of lime, ammonium sulfate, a little phosphate, and water, is a promising process."

Also in an investigation of the losses of plant nutrients from stable manures exposed to western Oregon weather conditions the observation was made that "where straw or other absorbents were used, the total loss of plant food was increased, but the percentage loss was decreased. Superphosphate was found to be most effective as an absorbent for preventing loss by leaching."

Report is made also of a miscellaneous group of investigations which, like those above noted, continue for the most part work previously recorded (E. S. R., 55, p. 625).

[Soil fertility work at the Umatilla Substation] (*Oregon Sta. Bien. Rpt. 1925–26, pp. 114, 115*).—Fertilizer experiments of the usual type in progress for 11 years preceding the date of the present report are summarized with respect to results obtained in the biennium here covered.

Fertilizer experiments with crops (*South Carolina Sta. Rpt. 1928, pp. 85, 86, fig. 1*).—Potassic fertilizer increased seed cotton yields to from 530 to 800 lbs. per acre as compared with but 240 lbs. per acre where the potassium was not supplied. The application in another experiment of 800 lbs. per acre of "high grade fertilizer" increased the seed cotton yield from 140 to 893 lbs.

Experiments with fertilizers on rotated and non-rotated crops, E. B. Reynolds (*Texas Sta. Bul. 390 (1928), pp. 39, figs. 2*).—This is a report of experiments conducted over a period of 14 years to study the effect of fertilizers, manure, removal of crop residues, and rotation on the yield of crops. The fertilizer treatments included superphosphate, superphosphate and manure, superphosphate and cottonseed meal, manure, rock phosphate, and rock phosphate and manure. Cotton and corn were grown continuously on the same land and in rotation with oats and cowpeas.

The soil responded more readily to nitrogenous than to phosphatic fertilizers. The increases in yield resulting from the fertilizer treatments, however, were not in general very profitable. Manure was the most profitable treatment on cotton, giving an average yearly profit of $6.36 per acre. None of the fertilizer treatments applied to corn were very profitable; rock phosphate gave the largest profit, which was only 88 cts. per acre yearly. Superphosphate was equally effective in increasing yields but was more expensive.

The removal of crop residues over a period of 14 years has produced a slight, though not significant, decline in the productiveness of the soil.

Rotation produced significant increases in the yield of cotton and corn. The yield of cotton was increased 14 per cent and the yield of corn 47.5 per cent in comparison with the yield of continuous cotton and corn, respectively. Rotation produced larger increases in yield than did fertilizers, but the largest yields were obtained from rotation with fertilizers. In fact, the increase in yield resulting from the combined practice of rotation and use of fertilizers was greater than the sum of the increases produced by rotation and fertilizers separately. The average net return of the four crops in this rotation was $9.19, as compared with $21.75 per acre for continuous cotton, but the author advocates a 2-year rotation of cotton and feed crops.

Investigations on the decomposition and action of nitrogen and carbon compounds in manure [trans. title], K. SCHEIBE (*Landw. Vers. Sta., 108 (1929), No. 1-2, pp. 61-114, fig. 1*).—The general conclusions from the various experiments reported in this article are that manure stored in closed receptacles suffers less loss, decomposes more readily in the soil, and is better utilized by crops than that kept in the ordinary way in open heaps or deep stalls.

The germ content and action of variously handled manure [trans. title], W. GOETERS (*Landw. Vers. Sta., 108 (1929), No. 1-2, pp. 1-60*).—It is shown that the temperature of fermentation has a pronounced influence on the number, kind, and activity of organisms in manure. High temperatures (60-80° C.) as well as low (0°) reduced the number of organisms. Most of the vegetative organisms were killed at the higher temperatures. The urea bacteria were found to be among the more resistant organisms and to play an important part in the ripening of manure. The survival and behavior of the organisms varied in different parts of the manure heap. Hot-fermented manure showed a higher nitrifying capacity when mixed with soil, more readily assimilable nitrogen, and increased crop yields more than that fermented at lower temperatures.

[Manure and fertilizer experiments] (*Oregon Sta. Bien. Rpt. 1925-26, pp. 110-111*).—Upland fertilizer experiments at the Astoria Substation for the biennium reported are said to "strengthen the conclusion that manure is essential to profitable and permanent production; that lime is beneficial to all of the desirable forage crops of this section and may be necessary to permanent agriculture; and that superphosphate is beneficial to most cultivated crops and especially to root crops."

A series of results with fertilizers on rutabagas on upland soils in 1926 are tabulated.

The substitution of stable manure by fertilizers, green manure, and peat, III, B. L. HARTWELL and F. K. CRANDALL (*Rhode Island Sta. Bul. 216 (1928), pp. 20*).—This bulletin extends to cover the fourth round the report of the 3-year manuring and fertilizer experiment rotation of the station (E. S. R., 53, p. 723), and summarizes 12 years of the experiment, the results shown being in general very similar to those noted from the previous bulletin above cited.

It is noted that "in the neutralized soil of the rotation, chlorosis, due to lack of available manganese, developed with some of the crops. Those which were benefited by applications of manganous salts were oats, spinach, beets, and lettuce. Tomatoes, celery, and cabbage were not benefited." In the peat plats, even though neutralized, only acid-resistant crops made "fairly satisfactory" growth.

Further experiments on the nitrification of manures and fertilizers and of tea prunings, A. W. R. JOACHIM and D. G. PANDITTESEKERE (*Trop. Agr. [Ceylon], 71 (1928), No. 3, pp. 131-140, pls. 2*).—In laboratory and field studies of the rate and completeness of nitrification of urea, calcium cyanamide, ammonium sulfate, Ammophos, manure, and various organic (vegetable and animal) materials, a high rate of nitrification was observed, the first maximum being reached in the sixth to the eighth week, with a secondary period of high nitrification from the twelfth to the fourteenth week. No direct effect of the materials on the nitrogen of the soil was evident after the fourth or fifth month. Tea prunings showed slow decomposition and nitrification, especially in case of dried prunings, and there was an actual loss of nitrogen in the soil during the experimental period with both green and dry prunings.

Cover crops for soil improvement (*South Carolina Sta. Rpt. 1928, pp. 67, 68, fig. 1*).—Winter cover crops—vetch and rye, or Austrian winter field peas—have increased crop yields very largely, an increase of 100 per cent over the yields of 1921 being attributed principally to the use of winter cover crops. A 30-acre field producing but 13 bu. per acre of corn, or 600 lbs. of seed cotton, up to 1925 was treated with vetch and rye turned under in the spring of 1926 and was then planted to cotton. Since 1925 the field has been used for cotton each year with a cover during the winter, and is reported as having produced more than 1,200 lbs. of seed cotton per acre each year.

Soil investigations at Hood River (*Oregon Sta. Bien. Rpt. 1925–26, p. 76*).—"From the data obtained it is apparent that [in orchard soils] a leguminous crop—vetch or alfalfa—disked or in some manner turned under, is the means of inducing the formation of large amounts of nitrogen in nitrate and ammonia form. . . . There are many factors involved here, but a reasonable conclusion . . . would seem to be that these leguminous cover crops are the means of yielding to the trees and to crops the much-needed nitrogen for thrifty appearance and growth."

Management of cane soils, J. O. Carrero (*Porto Rico Sta. Rpt. 1927, pp. 8–11*).—The work on the utilization of nitrogen by cane soils, noted from the preceding report (E. S. R., 58, p. 508), has been concluded, and the general results are here summarized.

Plowing under of tops, trash, and green manure afforded little change for the better for the plant cane crop in the no-nitrogen limed section, but proved to be beneficial in the unlimed section. The first ratoon, however, gave a complete reversal of this result. Where nitrogen was applied, either as sodium nitrate or ammonium sulfate, no benefit was observed from plowing under tops, trash, and green manure or from burning the trash.

Commercial fertilizers, 1929 edition, R. H. Robinson, C. F. Whitaker, and D. E. Bullis (*Oregon Sta. Circ. 87 (1929), pp. 24*).—The bulletin constitutes the usual yearly analytical report on fertilizers and on limes and land plasters. "The consumer is advised to purchase the high-grade fertilizers, i. e., fertilizers having a total plant-food content of 15 per cent or more."

New fertilizer materials and their uses, J. J. Skinner (*North Carolina Sta. Agron. Inform. Circ. 22 (1929), pp. 6*).—The following fertilizers are described and given brief individual discussion: Ammonium nitrate, ammonium chloride, ammonium phosphate, Ammophos, Diammophos, urea, urea phosphate, calcium nitrate, potassium ammonium phosphate, Calurea, Nitrophoska, potassium ammonium nitrate, Leunaphos, and Leunaphoska. It is stated in summarizing this section of the paper that "many of the difficulties pertaining to the keeping qualities and distribution of concentrated fertilizers, which a year or two ago seemed insurmountable have been overcome, and the formation of a desirable mixture which will drill uniformly with present-day machinery has been achieved."

The remainder of the circular takes up the effect of concentrated fertilizers in the growing of cotton on North Carolina soils. After showing from the results of these experiments that there is some danger of crop injury in the use of very concentrated mixtures, even when the fertilizer is applied ten days prior to planting, the author concludes that "the practical compromise may well be the production of fertilizer mixtures not of extreme concentration, but still considerably more concentrated than the present average commercial fertilizer."

Commercial fertilizers, L. L. Van Slyke (*New York State Sta. Bul. 557 (1928), pp. 24*).—Part 1 of this bulletin presents a summary history of the fertilizer control work of the station from 1890 to 1928, a period during which more than 25,000 samples are said to have been analyzed.

Part 2 presents "numerous facts in relation to commercial fertilizers in New York State for the year 1928, together with a general review for the 15 years from 1913 to 1928. . . . In the case of complete fertilizers, the average amount of plant food is greater in recent years than at any time in the history of the fertilizer trade. This is due to a marked increase in the number of high-analysis or concentrated fertilizers."

Nitrogen fixation: The growth of a new British industry, A. A. E. (*Nature [London], 123 (1929), Nos. 3088, pp. 18-20; 3089, pp. 51-54, figs. 5*).—The rapid development of the nitrogen fixation industry, especially in Great Britain but also in other countries, is noted, and the processes used, especially the synthetic ammonia process, are discussed.

It is stated that "the growth of the fixed nitrogen industry has lowered the prices, in terms of goods, of all nitrogenous fertilizers, and of phosphates and potash also, but we still lack sufficient accurate and coordinated scientific knowledge of the extent of the benefits which may be ours. . . . Unless new knowledge is acquired, unless education in the modern use of nitrogenous fertilizers is advanced, the danger of overproduction may be great."

Phosphorus and calcium deficiencies in forage, E. Burke et al. (*Montana Sta. Rpt. 1927, pp. 88-90, fig. 1*).—The bone-eating habit of cattle was traced to phosphorus deficiency in the hays and grasses eaten and was found to be confined largely to swampy areas, in the grasses of which the phosphorus content was shown to be much lower than in the upland grasses.

Triple superphosphate at the rate of 200 lbs. per acre increased the yield of alfalfa first cutting by 3 per cent and improved the phosphorus content by 10.41 per cent. The second cutting was increased by 3.10 per cent in yield and 6.39 per cent in phosphorus content. The work was carried on at the station farm, where the phosphorus content (0.08 to 0.10 per cent) is said to be greater than that found generally in Montana soils. On a farm in the northern end of the Gallatin Valley 200 lbs. per acre of triple superphosphate increased the alfalfa first-cutting yields by 8 per cent and the phosphorus content by 58.64 per cent. The phosphorus content of the second cutting was found to be 47.31 per cent higher. Pot experiments on a number of soils with alfalfa, clover, and timothy gave similar indications.

Fertilization of soils poor in lime: Comparative tests of different carbonates [trans. title], G. Rivière and G. Pichard (*Compt. Rend. Acad. Sci. [Paris], 187 (1928), No. 23, pp. 1068-1070; abs. in Rev. Sci. [Paris], 67 (1929), No. 1, p. 24*).—In comparative tests of equal molecular quantities of the carbonates of calcium, magnesium, sodium, and potash in experiments with wheat and oats on alkaline soils poor in lime but well supplied with nitrogen, phosphorus, and potash (one soil being especially high in potash), the greatest increase in yield was obtained with sodium carbonate. This is attributed to the action of the sodium carbonate both in increasing nitrification of the reserve nitrogen of the soil and in supplying a need of the plant for sodium.

Commercial fertilizers, 1928, J. M. Bartlett (*Maine Sta. Off. Insp. 129 (1928), pp. 61-84*).—The usual annual report of fertilizer analyses showed but 6 out of 307 samples of mixed fertilizers to be deficient in all three guaranteed elements. "The unmixed goods examined, as usual, conformed quite closely to the guarantees."

AGRICULTURAL BOTANY

Negative results on physiological balance in soil cultures, R. P. Hibbard (*Plant Physiol., 2 (1927), No. 1, pp. 1-18, figs. 11*).—This paper reports an experimental study of the theory of physiological balance in soil cultures. The method of attack is that for water culture investigations suggested by Schreiner and Skinner in 1910, fully described by them in 1918 (E. S. R., 40, p. 126), and further developed by Livingston and Tottingham (E. S. R., 40, p. 520).

The data from this work, including material as yet unpublished, are considered to suggest that nothing can be gained by attempting, through the use of the triangular system of fertilizer ratios, to find a definite ratio of salts, or, in other words, a physiological balance in soil cultures. The evidence is not thought to justify the drawing of any other conclusion than that for cereals, such as wheat, oats, and corn, the yields may be quite identical under somewhat wide variations of fertilizer ratios. The many factors suggested as possible agents in producing the negative results were considered without finding any satisfactory explanation. It is suggested that the crops tested have been so modified by domestication that they have become accustomed to wide variations in environmental conditions and for that reason are not suitable indicators for studies of this kind. Results might have been different with some wild variety raised in a restricted environment. It is quite apparent from knowledge already acquired that different proportions of the essential elements are required for the different phases of growth. These proportions probably vary from week to week throughout the life of the plant, chiefly because there is a variation in the salt content of all ordinary soils. The author holds that a rather wide range of salt ratios can be used without causing appreciable differences in yields.

Under the conditions here employed, the use of single fertilizer ingredients does not give as good results in soil cultures as a combination of three. This conclusion is confirmed by experiments both in soil cultures and in water cultures. It is thought that only under conditions where the price for a mixture of the three fertilizer ingredients is prohibitive would the use of single fertilizers be advisable.

Soil-moisture conditions in relation to plant growth, F. J. Veihmeyer and A. H. Hendrickson, (*Plant Physiol., 2 (1927), No. 1, pp. 71–82, figs. 6*).—Observations extending over a number of years in deciduous fruit orchards in California and in experimental plats at Davis indicate that the soil-moisture supply may fluctuate between wide limits without measurably affecting the growth of the tree or the yield and quality of the fruit.

The authors hold that experimental results based on the idea that water applied at any point in the soil would be quickly and uniformly distributed throughout the surrounding soil have led to many erroneous conclusions. They have been unable to maintain any soil-moisture content lower than that which the soil would hold against the force of gravity—the maximum field capacity. A rain of 2.15 in. on the surface of a loam soil resulted in wetting the soil to a uniform depth of about 14 in. but no farther during the period of 48 hours after the cessation of the rain. In general, an application of a definite amount of water on the soil surface wets the loam soils, such as here used, always just to a definite depth, which depends upon the water-holding capacity of the soil and its initial moisture content. This appears to be equally true in field plats and in large containers. No definite evidence appeared of the deeper soil being wetted at all by the surface application.

The results obtained in these experiments are contrary to a long-accepted belief that water moves by capillarity with considerable speed from moist to drier soils. Such movement as occurs has been found in these tests to be extremely slow in rate and slight in amount and extent. The extent of movement in either the upward or the downward direction was approximately 8 in. during 139 days. These results were obtained in numerous trials with soils of different initial moisture contents. In experiments with trees in containers, the soil mass was raised to its maximum field capacity throughout at each application of water. The use of water was nearly proportional to the leaf area and still more nearly proportional to the growth in length.

When the soil-moisture content was reduced to a percentage corresponding approximately to the calculated wilting coefficient, the trees wilted and revived only when water was applied to the soil. Remarkable agreement appears between the observed and the calculated wilting coefficient.

Still further evidence of the importance of the wilting coefficient as a critical point in the process of soil-moisture depletion by plant transpiration was secured from studies on the width of stomatal openings. Apricot, prune, and peach trees growing on soil having water content higher than that corresponding to the wilting coefficient showed markedly wider stomatal openings by day than did those grown on soil with water content at or near the wilting coefficient.

Trials with mature peach and prune trees showed that growth in length of shoots could not be prolonged indefinitely by maintaining high soil-moisture contents throughout the season, and the same result was secured with young trees in containers. If the average percentage of water in leaves and bark and wood of all parts of the trees may be used as a criterion of maturity, the results obtained with bearing peach trees indicate that trees growing on wet soils matured at the same time as trees on nearly dry soils. Young trees on moist soil held in containers dropped their leaves at the same time in the fall as those on drier soils. Defoliation, however, could be brought about during periods of high evaporating conditions by withholding water until the trees wilted.

The data secured in these studies seem to have an important bearing on numerous questions regarding the relation between irrigation and the hardening or maturing of the wood and buds of fruit trees. Abundant soil moisture supplied throughout the season can not alone account for the immaturity of the current growth of the tree and so-called winter injury that seems to be a result of such immaturity.

The relation of leaf area to use of water by the tree has an important bearing on irrigation practice, especially when alfalfa is grown in the orchard as a continuous cover crop. The combination of trees and alfalfa requires more water than do trees alone. It is believed that any benefits derived by the trees from the growing of alfalfa in this way are due probably to causes other than lessened transpiration on the part of the tree.

On the influence of reaction of the medium on germination of spores of Verticillium alboatrum and Ustilago maydis [trans. title], P. Leszczenko (*Pam. Państ. Inst. Nauk. Gosp. Wiejsk. Pulawach* (*Mém. Inst. Natl. Polon. Econ. Rurale Pulawy*), 7 (*1926*), *A*, *pp. 402–435; Eng. abs., pp. 433–435*).—In experimentation on the mode of causation of the noxious influence exerted by aqueous solutions of acids and of their potassium salts on the chlamydospores of *U. maydis* and on the conidia of *V. alboatrum*, it is said to have been found that this adverse effect depends on the influence of ions or on the combined influence of hydrogen and neutral salt ions. This noxious influence bears no relation to the undissociated molecules. The injurious effect depends upon the degree of dissociation and the concentration of the ions in the solution. When determining theoretically the degree of the noxious effect of a neutral salt on fungus spores, it is necessary to take into consideration the degree of injury due to the cation and the anion, also the degree of dissociation and that of concentration in solution. In the case of equimolecular acid solutions, the injurious effects of their anions and the degree of dissociation are to be considered. The H ion has the power of increasing the injury of cations of neutral salts to spores of fungi, when combined in solution. The presence of the OH ion in solution increases the injurious effect of neutral salts to spores by augmenting the permeability of the membrane of cells and thus facilitating the reaction of cations to plasma.

Does the pea plant fix atmospheric nitrogen? D. Burk (*Plant Physiol., 2 (1927), No. 1, pp. 83–90*).—It is claimed that the dwarf variety of *Pisum sativum* when grown under the general conditions employed in the work here outlined, either in the absence or in the presence of additional nitrogen in the original culture solution and kept sterile until planted, showed some loss of nitrogen. The loss occurred during the growing period after germination.

Chemical studies in the physiology of apples, V, VI, J. W. Brown (*Ann. Bot. [London], 40 (1926), No. 157, pp. 129–147; 41 (1927), No. 161 pp. 127–137*).—Previous work by Haynes and Archbold (E. S. R., 58, p. 212) and Carré and Haynes (E. S. R., 47, p. 610) has been noted, wherein apples of a given variety grown on different soils have shown considerable variation in such properties as acidity, nitrogen content, and protein content, also in commercial qualities, as keeping property and flavor.

V. *Methods of ash analysis, and the effect of environment on the mineral constitution of the apple.*—This paper reports work bearing upon a corresponding variation as to mineral constituents in the ash of apples grown on different soils. Some work has also been done on the mineral constituents of the same variety of apples from trees grown on different stocks. Methods are described for the determination of total ash, potash, lime, magnesia, phosphate, and iron in apples.

An analysis of juices gave no consistent results, so dried apple material was employed. This represented Bramley Seedling apples grown on different soils in 1923 and 1924 and Lane Prince Albert apples grown on four East Malling stocks during the same seasons.

Analyses of Bramley Seedlings showed significant differences, as apples grown on gravel and silt soils had uniformly high total ash, potash, and phosphate, while apples grown on fen and fine silt soils gave low values for these constituents. Good keeping qualities were associated with high potash and phosphate. Bitter pit apples showed high ash and low phosphate. The influences of stocks are detailed. Some evidence was obtained supporting the theory as to the importance of the potash-nitrogen ratio in connection with the incidence of leaf scorch.

VI. *Correlation in the individual apple between the mineral constituents and other properties.*—The mean analytical data given in the paper above noted have been examined as to correlation of properties, seeking to discover signs of relationship between the different constituents when the variable effects of soil and climate were eliminated by taking apples from the same environment in the hope that the results might help to explain the function of some of the mineral constituents and their effect on the vital processes of the living plant.

When the dry weight, total ash, potash, phosphate, iron, nitrogen, and also the density, acidity, and pH of the juice were determined in each of 30 Bramley Seedling apples from the same orchard, the green apples showed lower percentages of dry weight, total ash, potash, and pH, and a higher percentage of nitrogen when compared with the yellow and the red and yellow apples. Low values for the H-ion concentration of the juice were found to be associated with high total ash and potash content.

The third partial correlations were calculated between potash, phosphate, iron, nitrogen, and acidity. Significant values, showing direct correlation between the elements compared, were obtained for potash and phosphate, phosphate and acidity, and phosphate and iron. Potash and iron, and potash and acidity, are inversely correlated. No significant correlations were observed between nitrogen and any of the mineral constituents. Suggestions are offered as to the observed correlations.

On the passage of boric acid and certain salts into fruits and vegetables, L. KAHLENBERG and R. TRAXLER (*Plant Physiol., 2 (1927), No. 1, pp. 39–54*).—Various fruits and vegetables were immersed in solutions, and the freedom with which the solutes entered was determined. The solutions used were mostly molar, but in a few cases saturated solutions were used of LiCl, $LiNO_3$, Li_2SO_4, $Li_2B_4O_7$, H_3BO_3, $Na_2B_4O_7$, KI, $BaCl_2$, and $SrCl_2$. Details of tests and conditions are given, with differences in behavior.

The rôle of boron in the growth of plants, W. E. BRENCHLEY and K. WARINGTON (*Ann. Bot. [London], 41 (1927), No. 161, pp. 167–187, pls. 2*).—The accounts by Warington previously noted (E. S. R., 53, p. 26; 58, p. 725) have left open the question whether or not the beneficial action of boron on the growth of certain plants is confined to particular growth conditions. The detailed investigation of nodule structure, which is vitally affected by the absence of boron, has been described by Brenchley and Thornton (E. S. R., 60, p. 28).

In the preliminary water-culture work investigating the effect of boron on plant growth, the Rothamsted nutrient solution, pH 3.8, was employed. To meet the questions which naturally arose, this culture was modified as is here shown and briefly discussed. The results of this study are detailed.

The need of certain plants for boron seems not to be affected by the nature of the substratum on which they grow, the aeration conditions at the roots, or, in the case of leguminous plants, the presence or absence of nodules thereon. In water cultures the necessity for boron appears to be independent of the composition or pH value of the nutritive solution. The concentration of boric acid appears to be unimportant if an adequate (though not excessive) total quantity is supplied during a given period, but this total supply is somewhat lessened when the nutritive solution is frequently renewed. The chemical combination in which boron is presented to the plant is immaterial, even the so-called insoluble borates being effective, though no other of the 52 elements tested has proved capable of replacing boron. Special attention was given to manganese in this connection.

Boron proved to be essential for several leguminous plants and for melon, though various cereals and candytuft complete their development without it. It remains to be proved whether plants of the latter class require so little boron that a sufficient supply is stored up in their seeds.

The physiological function of boron in the nutrition of broad bean is under investigation. Boron does not replace any one of the essential nutritive elements, but a definite association of this element with the absorption or utilization of calcium is strongly suggested. Boron does not act as an ordinary catalyst, but appears to be absorbed and in some way removed from action, so that a constant supply of boron is necessary.

A brief addendum gives an account of tests more recent than those recorded in the body of this paper. From these it appears that a plentiful supply of nutrients and the maintenance of a constant balance in the food solutions encourage growth for a longer period before signs of boron starvation appear, but that such supply can not prevent the ultimate death of the plant from the lack of boron.

Urea in higher plants [trans. title], K. TAUBÖCK (*Österr. Bot. Ztschr., 76 (1927), No. 1, pp. 43–56, figs. 3*).—With a view to ascertaining the physiological rôle of urea in higher plants, the author has elaborated a method, claimed to be simple and unequivocal, for separating and preparing urea when present in very small proportions in tissue sections and fragments of plant organs. By this method the occurrence was demonstrated of urea during the germination of plants of various types.

Inhibition of pollen growth by living tissue extracts, P. O'Connor (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1927), No. 40, pp. 477–484*).—As a result of experimentation which is detailed, with discussion, it is considered to have been shown that the fluids of each species of plant or of animal contain a simple, diffusible substance, specific in its character, which is toxic to the protoplasm of all other species; that this substance is not destroyed by boiling and that this is probably an amino compound.

Abnormal behavior in Beta vulgaris [trans. title], C. Sibilia (*Biol. R. Staz. Patol. Veg. [Rome], n. ser., 7 (1927), No. 2, pp. 215–218, figs. 3*).—A beet plant (*B. vulgaris rubra*) left to itself has lived for three years, has become perennial, and has produced each year new shoots, showing the phenomenon of partial tuberization, which is briefly described.

GENETICS

Contributions to the presentation of the genetic classification of the races of farm animals [trans. title], A. Maligonov (*Trudy Kuban. Selsk. Khoz. Inst. (Arb. Kuban. Landw. Inst.), 3 (1925), pp. 345–377, figs. 15*).—The author discusses current theories for the classification of farm animals and presents a scheme of classifying the various animals on the basis of their genesis as manifested in their genotypes. He outlines and discusses the various elements necessary for the study of farm animals from the standpoint of their genetics.

The present position of our knowledge of the inheritance of horns in cattle [trans. title], H. F. Krallinger (*Züchtungskunde, 3 (1928), No. 3, pp. 122–126*).—A brief review of the inheritance of horns in cattle, with reference to the control of this characteristic by a simple autosomal Mendelian factor or by a more complicated sex-linked inheritance.

Inheritance of twins in horses [trans. title], C. Wriedt (*Züchtungskunde, 3 (1928), No. 9, pp. 455–457*).—From a study of twinning in mares, the author finds no indication that the tendency to produce twins is inherited.

The inheritance of white spotting in the house cat [trans. title], A. Kühn and F. Kröning (*Züchtungskunde, 3 (1928), No. 9, pp. 448–454, figs. 2*).—The author explains the inheritance of white spotting in cats on a single-factor basis with a lack of dominance.

On the chromosomes of the cat, O. Minouchi (*Imp. Acad. [Japan], Proc., 4 (1928), No. 3, pp. 128–130, figs. 4*).—From a study of spermatogenesis in the cat, the author found that there were 38 diploid chromosomes, which included the X and Y, the former being rod shaped and of medium length, while the latter was one of the smallest of the chromosomes.

On the mechanism of chromosome behavior in male and female Drosophila, J. W. Gowen (*Natl. Acad. Sci. Proc., 14 (1928), No. 6, pp. 475–477*).—The distribution of the progeny obtained in reciprocal outcrosses of males and females homozygous for complete linkage and producing a high frequency of triploids, sex intergrades, nondisjunctional males and females, and a class of weak flies, differed so widely in the two crosses that there was no doubt that the chromosomes of male and female Drosophila passed through divergent phases in at least two particulars, i. e., chromosomal linkage and nondisjunction.

A fifth allelomorph in the agouti series of the house mouse, L. C. Dunn (*Natl. Acad. Sci. Proc., 14 (1928), No. 10, pp. 816–819*).—The author describes a character called black-and-tan in mice, which is found to be due to a fifth allelomorph in the agouti series. In experiments at the Connecticut Storrs Experiment Station black-and-tan was dominant to nonagouti but recessive to wild-type agouti, making the order of dominance in this series as follows: Yellow, white-bellied agouti, wild-type agouti, black-and-tan, and nonagouti. There was a progressive increase in the amount of black in passing through the first to the last of the series. The type of black-and-tan here described is phenotypically the same as that previously reported,[1] which was found to be due to multiple factors for black pigmentation. Some complications in the identification of the genes involved were noted.

Linkage studies in barley, D. W. Robertson (*Genetics, 14 (1929), No. 1, pp. 1–36, figs. 2*).—The inheritance of simple Mendelian factor pairs in barley and their possible linkage relations with particular attention to the linkage of certain chlorophyll deficiencies was studied at the Colorado Experiment Station, six varieties being used in the crosses.

Simple Mendelian inheritance was found for the pairs black v. white glume color (*Bb*), hoods v. awns (*Kk*), covered v. naked seed (*Nn*), non-6-rowed v. 6-rowed (*Vv*), long- v. short-haired rachilla (*Ss*), green v. white seedlings (A_ca_c), green v. white seedlings (A_ta_t), and green v. xantha seedlings (X_cx_c). A two-factor difference was found for fertility of the lateral florets in crosses involving Colsess, a 6-rowed barley, and *Hordeum deficiens nudideficiens*, Colsess×Minnesota 90–5. It appeared that Colsess has the genetic constitution *vv* II, while *H. deficiens nudideficiens* and Minnesota 90–5 have the genetic constitution *VV* ii.

Three genetically different seedling chlorophyll deficiencies, designated as white a_ta_t, white a_ca_c, and xantha x_cx_c, were found to be inherited as simple Mendelian recessives. Two complementary factors for chlorophyll production were found in a strain of Colsess, one factor pair being A_ca_c.

The character pairs black v. white glume color, hoods v. awns, covered v. naked seed, non-6-rowed v. 6-rowed, and long- v. short-haired rachilla were all independent in inheritance, whereas studies of the interrelation of chlorophyll deficiencies and other characters indicate the probable linkage groups (1) green v. white seedlings A_ca_c, green v. xantha seedlings X_cx_c, and possibly hoods v. awns *Kk*, and (2) black v. white glume color *Bb*, and green v. white seedlings A_ta_t.

The inheritance of resistance to the Danysz bacillus in the rat, M. R. Irwin (*Iowa State Col. Jour. Sci., 2 (1928), No. 3, pp. 213–218*).—Studies at the Iowa Experiment Station indicated that two strains showed significant differences in their resistance to inoculation with standard doses of the Danysz bacillus. The selection within a random stock increased the resistance to this bacillus by crossing a resistant generation with an inbred susceptible strain. Resistance to disease was increased among the offspring. The inheritance of resistance appears to be due to a partially dominant, quite complex set of factors which interact with the environment.

The inheritance of resistance to fowl typhoid in chickens, W. V. Lambert and C. W. Knox (*Iowa State Col. Jour. Sci., 2 (1928), No. 3, pp. 179–187, fig. 1*).—Preliminary studies at the Iowa Experiment Station of resistance to fowl typhoid through the inoculation of mature individuals showed that 47.7 per cent died. In later experiments 6-day-old chicks were inoculated intraperitoneally with 12,000,000 organisms in physiological salt solution, and this was found to kill about 90 per cent of the inoculated birds. Chicks whose sires had survived such an inoculation showed a mortality of but 62.4 per cent, while chicks hatched from parents both of which survived an acute infection showed a mortality of 40.9 per cent. Significant differences were also noted in the mortality of chicks from different breeds. It is, therefore, concluded that resistance to fowl typhoid is inherited, but the mode of inheritance is not simple, multiple factors probably being involved.

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[1] The Sable Varieties of Mice, L. C. Dunn. Amer. Nat., 54 (1920), pp. 247–260.

Inherited epithelial defects in cattle, F. B. HADLEY and L. J. COLE (*Wisconsin Sta. Research Bul. 86 (1928), pp. 35, figs. 12*).—A more complete account of the inheritance of the defect designated as *Epitheliogenesis imperfecta neonatorum bovis,* a lethal in Holstein cattle found to be due to a recessive factor (E. S. R., 59, p. 823).

Investigations of fertility in swine with special reference to the relation of inbreeding [trans. title], W. VITZTHUM VON ECKSTAEDT (*Zuchtungskunde, 3 (1928), No. 10, pp. 473–496, figs. 7*).—From a study of the breeding records of 1,200 sows and 400 boars, the author found considerable differences in the fertility of the different females. The effects of inbreeding on fertility were variable. In some cases fertility seemed to be improved, while in others it was lowered. There was also considerable seasonal variation. The effect of age on size of litter was little in sows which were kept in the herd for a long time.

The influence of high temperature on the reproductive capacity of guinea-pig spermatozoa as determined by artificial insemination, W. C. YOUNG (*Physiol. Zool., 2 (1929), No. 1, pp. 1–8*).—The author reports the results of artificially inseminating 160 females with spermatozoa that had been subjected for 30 minutes in the tail of the epididymis to temperatures of 38, 40, 42, 44, 45, and 46° C. The proportion of pregnancy was reduced in those cases where the sperms were heated to 45 and 46°, but heating the sperms did not cause a greater tendency toward abortions and stillbirths and the offspring showed no loss of vigor.

The corpus luteum hormone.—I, Experimental relaxation of the pelvic ligaments of the guinea pig, F. L. HISAW (*Physiol. Zool., 2 (1929), No. 1, pp. 59–79, pls. 2*).—Studies of the cause of the relaxation of the pelvic ligaments in the guinea pig indicated that such could be induced by a 0.1-cc. dose of the best corpus luteum extracts if such were administered at or near oestrum when the follicular hormones were being or had been absorbed. Castrated females could be relaxed only by first injecting with some follicular hormone and then the corpus luteum extract. Males could not be relaxed except by first castrating and then feminizing them.

The hormone responsible for pelvic relaxation was found to be soluble in acid solutions, and it could be salted out of the blood of pregnant females. It was thermolabile and killed by drying at room temperature. The corpus luteum hormone was found in the blood of the pregnant rabbit, guinea pig, sow, cat, dog, and mare, but not in the woman or cow.

New evidence for the function of the scrotum, R. E. HELLER (*Physiol. Zool., 2 (1929), No. 1, pp. 9–17*).—Confining the epididymis, with the gonad portion of the testicle removed, in the abdomen caused the sperm contained therein to show motility for only about 12 days in the guinea pig as compared with the normal of 23 days without the gonad or 70 days with the other gonad present, and about 6 to 7 days in the rat as compared with the normal of 18 days without or 30 days with the other gonad intact. Thus the thermoregulatory function of the scrotum extends the life of the spermatozoa as well as the germinal tissue in the testicle. There was no apparent difference in the length of life of the spermatozoa in the cryptorchid epididymi whether the other gonad was left in the animal or removed at the time of the operation.

The problem of abnormalities with special consideration of its relation to sexual biology (intersexuality) [trans. title], K. KELLER (*Züchtungskunde, 3 (1928), No. 3, pp. 98–122, figs. 13*).—The author describes various abnormalities in animals, many of which are lethal, as well as intersexual characteristics in various domestic animals, including the freemartin.

Investigations of the possibility of sex determination at hatching in fowls, including a factor of analysis of the rate of feathering of chicks, E. HORN (*Untersuchungen uber die Möglichkeit einer Geschlechtsvorausbestimmung beim Hühnerei nebts einer Faktorenanalyse der Befiederungsgeschwindigkeit von Kücken. Inaug. Diss., Landw. Hochsch., Berlin, 1927, pp. 49, figs. 20*).—Studies of the sex ratios of 2,131 chickens showed that there were 51.63±2.50 per cent males among those dying between the eleventh and fifteenth days of incubation, 52.45±1.72 per cent among those dying between the fifteenth and twenty-first days of incubation, and 50.83±1.67 per cent males among those hatched. There was no relation between the sex ratio and egg weight, egg length, egg form, time of laying in the cycle or in the season, egg production, or crossbreeding. Sex-linked characters served to identify the sex at hatching in proper crosses.

FIELD CROPS

[Field crops work at the Alaska Stations], H. W. ALBERTS (*Alaska Stas. Rpt. 1927, pp. 9, 10, 14, 15–21, 25–28, figs. 6*).—Continued experiments (E. S. R., 58, p. 427) reported on included variety tests with potatoes, wheat, oats, barley, corn, peas, vetch, alfalfa, clover, soy beans, and miscellaneous root crops and grasses; a fertilizer trial with wheat; crop rotations; and production tests with Jerusalem artichokes and hay.

Analysis of native bluetop grass (*Calamagrostis* sp.) cut at Matanuska at weekly intervals from May 21 to November 12 indicated from June 25 to July 30 as the best period for haymaking, this usually being a time of light rainfall and clear weather. Wheat receiving fertilizer yielded better, but maturity was delayed. Alsike clover grew the same whether inoculated or not, although that sown with oats as a nurse crop made little growth until after the oats were harvested.

Potato plants emerged from the distal end quarters two days earlier than from proximal end quarters, but the latter produced more first-grade potatoes. Maximum yields were obtained from plantings of May 25. The number of tubers per plant increased with the later planting dates. When potato tubers were removed from the root cellar at different times sprouts were developed more slowly in strong sunlight than in subdued light, and length of sprout beyond 0.25 in. had little effect on time of blooming or on yield. Plants from tubers having short sprouts (0.25 in.) took longer to emerge from the soil than did those from tubers with long sprouts, i. e., from 3 to 4 in. Little difference was noted in the time from planting to blooming. The shorter and heavier sprouts were less liable to break off at planting. Sprouts toughened when exposed to sunlight for several days before planting.

[Agronomic work in Connecticut] (*Connecticut State Sta. Bul. 298 (1928), pp. 128, 129, 131–133, figs. 2*).—Canada Leaming corn, an F_1 combination of inbred Leaming strains and Canada Yellow Flint, is said to combine the productiveness and stalk of the dent with the earliness and grain quality of the flint. A new canning sweet corn, Golden Crosby, resulted from the combination of inbred strains of Golden Bantam and Crosby. Abnormal segregation of the sugary factor in certain corn families gave widely deviating ratios, in most cases large excess of recessive seeds and in others a marked deficiency. The ratios show larger variations from normal than found previously, indicating a new mode of inheritance.

Top-dressing with readily available nitrogen, such as ammonium sulfate, was the prime need for average lawn turf on soil similar to that at the station. Native grown seed of creeping bent, velvet bent, and Rhode Island bent appeared to be well adapted to local conditions where excellent drainage is provided. As good turf has been produced by seeding creeping bent as by planting the stolons.

Tobacco investigations have been noted in detail (E. S. R., 59, p. 733).

[Agronomic experiments in Montana], C. McKee, L. Powers, J. E. Norton, W. D. Hay, D. Hansen, A. E. Seamans, I. J. Jensen, B. B. Bayles, G. Morgan, D. A. Savage, F. M. Harrington, and C. C. Starring (*Montana Sta. Rpt. 1927, pp. 7–12, 14–33, 36–38, figs. 3*).—Outstanding varieties of winter and spring wheat, barley, oats, corn, peas, flax, potatoes, alfalfa, and miscellaneous forage crops are indicated from tests at the station and substations, the merits of flax-wheat mixtures (E. S. R., 57, p. 429) are noted, and the progress of crop standardization and pure seed work is discussed briefly.

Results so far obtained in irrigated crop rotations indicated that the yields of crops on the irrigated farms of the Gallatin Valley may be increased considerably by growing legumes, particularly alfalfa and clover. The culture of intertilled crops is recommended for increase in yield and for weed control. It is suggested that use of barnyard manure will probably help to increase crop yields and improve the physical condition of the soil.

Neither field beans nor soy beans appeared to be adapted to the high valleys with short seasons. Ladak alfalfa outyielded Grimm and Cossack, was better in quality, contained more leaves and protein, and was equal in winter hardiness. Cutting in the ½-bloom stage gave more alfalfa hay than cutting earlier or later, although it is suggested that cutting the first crop at $\frac{1}{10}$-bloom stage and the second at ½-bloom stage would give a high yield of good quality hay at the first cutting and the second crop would be harvested at a convenient time and still yield a maximum of high quality hay.

Several of the factors influencing the protein content of wheat appeared largely within the control of the farmer, i. e., good farm practices, such as manuring, rotating wheat with legumes, and clean fallow or summer tillage, give increased yields and produce wheat crops higher in quality as indicated by protein content. For the period from 1924 to 1927, inclusive, laboratory tests indicated that the average protein content of the Montana hard red spring wheat crop has been more than 1 per cent above the average for either Minnesota or North Dakota.

Continued comparisons showed that irrigated and dry land seed potatoes were again similar in productiveness. Certified seed decidedly led seed previously certified but rejected and lots never certified. In strain tests of seed stocks there were observed variations in stature of plants; differences in maturity; consistent differences in yield, the late maturing larger plants giving highest yields; and differences in disease tendency, with the smaller plants exhibiting more mosaic than the larger plants and the reverse holding with spindle tuber. Increasing the size of set within limits has resulted in a heavier yield, with the increase normally coming in the 2- to 12-oz. tuber size. Larger sets are recommended, a 3-oz. set not being too large for well-watered fertile soils. Bliss Triumph responded more readily to increase in size of set than did Netted Gem. In general, when the distance between hills was decreased the net yield and yield of seed-size tubers rose. There seemed to be a direct correlation between the quantity of seed used per acre, size of tubers produced, and the total yield. Trials of sets cut from different parts of the seed tuber indicated the value of cutting sets large enough to include eyes beyond the most basal eyes.

Potatoes in rotations including alfalfa or receiving manure at the Huntley Substation decidedly outyielded those in rotations lacking these treatments. Experiments with sugar beets have been noted in detail (E. S. R., 60, p. 636).

Great Northern field beans gave increased yields with seeding rates up to 35 lbs. per acre and yielded best in rows 30 in. apart. Seed from clear-podded beans yielded about 200 lbs. per acre more than those from striped pods.

In rotation and tillage tests at Huntley from 1913 to 1927, summer fallow as a summer treatment for small grains, especially winter wheat, made the highest average acre yields, and continuously cropped small grains yielded least, with yields on disked corn ground about intermediate. Neither green manure nor barnyard manure increased small grain yields more than did fallow. While continuous wheat averaged each year about one-half the yield made with fallow, it was more liable to crop failure, weed infestation, and called for double the seed and twice the cost of seeding and harvesting. With continuous cropped wheat, the average yields from plowed wheat land resembled those from wheat drilled into stubble without plowing. A rotation of summer tillage followed by two years of wheat, the second crop being drilled into the stubble of the preceding year, made an acre yield about equal to that from a 2-year fallow and wheat rotation and had certain advantages. Corn experiments on dry land have been noted (E. S. R., 56, p. 434). Flax seemed to respond to various tillage and cropping methods about the same as small grains, and cereals after flax did not average less than when following themselves in rotations. Small grains drilled into cleanly cultivated bean land returned average yields approaching those from summer-tilled land.

The merits of seeding winter wheat with the furrow drill and using the duckfoot cultivator for working fallow are again emphasized from studies at the Judith Basin Substation. Cultural methods for wheat in the region have been reported on (E. S. R., 59, p. 37). Delaying seeding of spring wheat on plats badly infested with wild oats until the weeds started and then destroying weed growth with a duckfoot type cultivator has resulted in a crop practically weed-free that season. Pasture experiments with dairy cows showed sweet clover, brome grass, and crested wheatgrass to be highly promising for dry-land pastures. Where bloat is not a problem, sweet clover seemed the best dry-land crop for pasture in a rotation. Although crested wheatgrass is not quite so palatable as brome grass, it equals it in milk and feed value and was very promising for permanent pasture. Corn was noteworthy among the annual forage crops tested.

In trials of dry-land cultural methods at the Northern Montana Substation summer fallow produced the heaviest yields for all crops, with disked corn ground, spring plowing, and fall plowing ranking in yield in order. Continuous cropping including stubble resulted in a marked decline in yield. Cultural tests described briefly included plowing of stubble and fallow for small grain, preparing fallow for wheat, and planting tests with wheat, corn, and oats. Wheat experiments at this substation have been noted (E. S. R., 56, p. 737). Winter rye averaged 38.3 bu. per acre and spring rye 35.6 bu., but the hay yields of spring rye were slightly greater and better in quality. Peas have produced the highest average yield of the annual forages, with oats, wheat, and barley ranking as named. Pea-grain mixtures seldom outyielded peas or grain alone and often made less, although the hay quality was better. Millet approximated barley in yield and thrived when seeded much later than small grains. Beneficial effects from sweet clover and beans in irrigated rotations and of barnyard manure were apparent with sugar beets after 2 years of rotations. In the renovation of native sod during 3 years double disking and manuring of native grasses relieved sod-bound conditions and increased the more succulent grasses, and the total growth of high quality hay was greater than on the untreated areas.

[Field crops work in Oregon] (*Oregon Sta. Bien. Rpt. 1925–26, pp. 10, 11, 53–66, 78, 110, 112, 113, 114, 116, 117 122, 123–125, 129*).—Agronomic activities (E. S. R., 55, p. 637) reported on from the station and substations included variety tests with wheat, corn, oats, barley, seed and fiber flax, soy beans, seed and forage vetches and related plants, alfalfa, red clover, mangels, carrots, turnips, potatoes, sweet potatoes, silage crops, and miscellaneous grasses and legumes; breeding work with clover, wheat, oats, and barley; cultural (including seeding) tests with vetch, alfalfa, wheat, flax for seed and fiber, potatoes, millet, and sunflowers; fertilizer tests with corn, potatoes, and rutabagas; inoculation studies with legumes; trials of sugar beets; and crop rotations. The adaptation of many of the foregoing crops is indicated, and the merits of outstanding varieties are described.

Using rates between 8 and 20 lbs. per acre, the thicker alfalfa seeding gave the denser stands with fewer weeds the first year. While total yields differed little, hay from cultivated alfalfa was much better in quality than alfalfa from uncultivated plats. On land heavily infested with stem rot disease good survival was had from Grimm, Baltic, and Dakota No. 12 among American seed and from Cossack and single lots from Chile, South Africa, and India. At the Umatilla Substation winterkilling of alfalfa was most severe where the plants were too dry or too wet, and especially on land heavily graded in preparation for irrigation. Grimm and Turkestan strains were highly winter resistant.

Flax experiments showed that both fiber and seed flax should be planted early on a firm seed bed and that drilling shallow gives much more prompt germination and uniform stands and yields with less seed. Drilled seed produced much more fiber flax straw than seed broadcasted and harrowed in and had less weeds per acre. Formalin treatment retarded the crop and depressed yields, while copper carbonate seemed slightly beneficial.

The more soluble fertilizers applied underneath and in corn hills killed many kernels, whereas application on top of the hill was not injurious. Calcium sulfate underneath, in the hill, or on top appeared to stimulate the corn considerably, such that a greener and more vigorous growth resulted.

In potato experiments maximum yields were obtained from planting whole seed, or from planting large sets cut to produce the most plants per hill, or from using sizable quantities of seed in relatively small pieces, resulting in many plants per acre. Whole seed, reasonably free from disease, produced a yield comparable with cut sets weighing from ½ to 1 oz. more. Early planting generally outyielded later planting, and a 5-in. depth was usually better than a 3- or 7-in. depth.

Morning-glories exposed to the sun were killed better by sprays than when shaded. Where the plants presented the most foliage killing was deeper than where a minimum of foliage was exposed, suggesting that successive sprays might be more effective. Where excessively strong sprays are put on at one time the killing seems to be so sudden that there is little penetration. Ammonium sulfate at the rate of 22 oz. per gallon of water was effective on moss, plantain, and other wide-leaved lawn weeds. It appeared that spraying weed infested lawns with sodium arsenite in proper strength is the cheapest method of disposing of weeds and much more satisfactory than other means of applying poison, cutting, or pulling.

[Field crops work in Porto Rico in 1927], D. W. MAY, T. B. MCCLELLAND, and R. L. DAVIS (*Porto Rico Sta. Rpt. 1927, pp. 5, 6. 14, 15, 16, 17, 18, fig. 1*).—The merits of the cowpea, soy bean, velvet bean, and Uba cane for forage are described briefly, and breeding work with corn and sugar cane is noted as heretofore (E. S. R., 58, p. 531). Several hybrid seedlings of sugar cane were characterized by one or more qualities such as resistance to mosaic, productiveness, high content of sucrose, and ratooning power.

Cormels of the Penang taro weighing under 2 oz. gave heavier yields than larger cormels. Notes are given on dasheen and yam varieties.

[Field crops work in South Carolina] (*South Carolina Sta. Rpt. 1928, pp. 28–32, 62, 63, 66, 67, 71, 72, 80, 81, 84, 85, figs. 4*).—Further experiments (E. S. R., 58, p. 632) reported on from the station and substations included variety tests with corn, oats, rye, and winter legumes; fertilizer tests with corn, oats, potatoes, and tobacco; cultural tests with corn varieties for silage; and trials of miscellaneous grasses and legumes for forage and green manure.

Of the corn varieties tested over various periods, Paymaster, Douthit, Good man Prolific, and Hastings Prolific led at the station; Pee Dee No. 5, Coker Garrick, Douthit, and Brunson at the Pee Dee Substation; and Hastings, Goodman, and Weekley, all prolifics, and Douthit at the Coast Substation. In fertilizer tests where either phosphorus or potassium was the varying nutrient little difference was noted in the yield, corn production being almost directly related to the nitrogen applied. Rather liberal application of nitrogen practically doubled the yield, indicating that where phosphorous and potassium have been applied to previous crops little response is to be expected from their application to corn.

Where oats follow cotton in a rotation only a light application of complete fertilizer seemed to be needed at planting, this to be supplemented by a relatively heavy dressing of readily available nitrogen early in the spring. Oats yields were almost in direct relation to the quantity of available nitrogen applied at this time. All materials which supplied nitrogen as nitrate produced higher oats yields than other nitrogen carriers, probably because the soil had not warmed up enough at the time the top-dressing was applied to permit nitrification to proceed rapidly.

The Austrian Winter field pea was found hardier and more productive early in the season than hairy vetch at the station, and it was the best of several winter cover crops tested at the Pee Dee Substation. Early seedings of this legume seemed preferable to later seedings, and relatively heavy seeding gave best results. The Austrian Winter field pea contained 4.38 per cent of nitrogen and hairy vetch 4.14 per cent.

Extensive fertilizer experiments demonstrated that a complete fertilizer is necessary for best results with potatoes. One ton per acre seemed to be enough, since yield increases from 1.5 and 2 tons were not large enough to pay for the extra fertilizer and cost of application. The optimum formula varied with the somewhat different conditions at the station and Pee Dee and Coast Substations.

[Field crops experiments at the Western Washington Station] M. E. McCollam (*Western Washington Sta. Bul. 10-W (1928), pp. 10–13*).—Outstanding varieties tested over periods comprised Brown Squarehead, Wilhelmina, and Triplet wheat, Markton oats, Sutton Prizewinner, and Danish Sludstrup mangels, and Matchless White and Yellow Giant carrots. Alsike with timothy outyielded other clover-grass combinations for hay. In an upland permanent pasture experiment (E. S. R., 56, p. 824) a plat receiving lime and superphosphate (acid phosphate) furnished 90 days of grazing stocked at 3 head of 2-year-old Holsteins per acre, while the plat treated with manure and phosphate yielded 81 days of grazing. With potatoes and kale, potassium chloride gave a greater yield than potassium sulfate, and an inorganic complete fertilizer gave a greater yield than an organic complete fertilizer. With corn the reverse was true.

[Agronomic experiments in Wyoming] (*Wyoming Sta. Rpt. 1928, pp. 138–140, 159, 160, 162, 163*).—Crop varietal leaders at the station included

Norka and Marquis wheat, Banner and Golden Rain oats, Horn, Trebi, and Hannchen barley, and Irish Cobbler potatoes. Red clover alone and a combination of crested wheatgrass, timothy, and red clover led the forage combinations. Potato yields from whole tubers ranged from 327 bu. per acre from very small whole tubers to 374 bu. per acre from large whole tubers, all of which produced higher yields than fractional sets.

Wheat sown with the furrow drill outyielded that seeded with the ordinary drill at both Archer and Gillette. Winter wheat on fallow produced 45 per cent more at Sheridan than after some other grain crop. Oats made about 40 per cent more on fallow. Ladak led the alfalfa varieties at Sheridan, and Cossack led at Torrington where both alfalfa and small grain made much higher yields on land properly leveled for irrigation.

Woodland pasture, F. A. Welton and V. H. Morris (*Ohio Sta. Bimo. Bul., 14 (1929), No. 1, pp. 3–8, figs. 2*).—Grass grown in the woods yielded on a dry weight basis only about one-third as much per unit area as that grown in the open, averaged about 4 per cent higher in water content, and in both 1924 and 1925 and on practically all dates of clipping contained less sugars and starch. In each year more than 2.5 times as much green weight was produced in the open as in the woodland. That these differences in carbohydrates were due to the shading effect of the trees was confirmed in a supplementary test in which grass was shaded artificially. The grass grown in the open was somewhat richer in protein content on the green weight basis than the grass grown in the shade, whereas the reverse was true on dry weight.

[Cotton investigations in South Carolina] (*South Carolina Sta. Rpt. 1928, pp. 18–28, 68, 69, 76–80, figs. 6*).—The progress of investigations with cotton is reported on as heretofore (E. S. R., 58, p. 632).

Fertilizer experiments on different soil types led to the conclusion that nitrogen is the first limiting factor in cotton production in the State and phosphorus next. While the need for potassium is not so pronounced, it is necessary when the requirements for nitrogen and phosphorus have been met. Seed cotton yields rose with increase in the fertilizer application from 400 to 1,400 lbs. per acre. Increasing quantities of phosphorus increased yield and hastened the maturity of the crop. From 55 to 60 lbs. of phosphoric acid evidently could be used with advantage in hastening maturity, although larger quantities were without material effect. However, increasing the phosphoric acid in the analysis up to 10 per cent slightly increased total yield.

Application of 100 lbs. of sodium nitrate in addition to the regular fertilizer gave an average yield of 1,178 lbs. of seed cotton per acre as compared with 1,169 lbs. from an equivalent quantity of ammonium sulfate, suggesting that the materials are similar in efficiency. Without side application the yield was 1,009 lbs. Each successive 50 lbs. of sodium nitrate from 50 to 300 lbs. per acre applied as a side dressing increased the yield of seed cotton about 37 lbs. The best time to make side application of readily available nitrogen sources seemed to be within about two weeks after chopping.

Fertilizer placement studies gave indications that in general the closer the fertilizer is placed to the cotton seed without impairing germination the more efficient it is in increasing yield. A placement which causes a slight injury to stand quite often returns a better final yield. Placing the fertilizer in bands on either side and at the same level as the seed appears most satisfactory when both germination and final yield are considered.

A relatively small proportion of the nitrogen seemed to be required from organic sources. Different nitrogen sources alone and in combination showed considerable range in the rate of nitrification, especially for several weeks after application. After August 15 practically no nitrates were found on any plats, indicating that they were utilized by the growing plants as rapidly as formed. The retardation in nitrification on a plat receiving rye straw seemed due to the use of the available nitrogen by bacteria in decomposing the straw. Cotton on this plat showed the effect of nitrogen starvation early in the season. Not the slightest trace of actual ammonia was found in the soil July 15 or later, indicating that even where ammonium salts were applied they were changed to other forms and did not remain long in the soil as ammonium compounds.

The quantity of soluble phosphorus was found considerably higher on limed plats than on unlimed plats. The soluble phosphorus content of the soil remained remarkably constant during the growing season.

The maximum soil temperature during June and July occurred about 7.30 p. m., and the daily range was about 3.6° F., indicating that soil temperature is fairly constant at a depth of but a few inches. The cotton grew very poorly until the soil temperature rose above 70°.

Seed delinted with sulfuric acid again gave the highest total yield of variously treated seeds and was followed by the machine-delinted seed. Rolling in sodium nitrate continued to give unsatisfactory returns, producing less seed cotton than no treatment. The earliest plantings gave the highest yields, there being little difference from plantings made March 21 and April 15. Evidently in normal seasons all cotton in upper South Carolina should be planted by about April 20 for highest yields. Closely spaced cotton again produced best, the 8-in. spacing giving 1,439 lbs. of seed cotton per acre, followed by unthinned, 16-in., and 24-in. spacing in order.

While King, Cook 1010, Coker Cleveland 5, Bottoms, and Cook 588-219 led with yields ranging from 879 to 848 lbs. per acre, only the strain of Cleveland stapled as long as 1 in. At the Coast Substation Humco-Cleveland 20-2 and Dixie Triumph led with 1,840 and 1,800 lbs. of seed cotton, respectively.

Trials at the Pee Dee Substation showed that cotton spaced 6 in. apart in the drill will fruit as rapidly early in the season as cotton plants 2 ft. apart. The work indicated that a large number of stalks per acre will insure a full crop early in the season with favorable conditions. Wider spacings require more time to set a full crop of fruit, and the danger from boll weevil damage or seasonal injury is greater. Tests of the source, quantity, and time of applying nitrogen gave results in accord with those noted earlier. Sodium nitrate as a side application returned its greatest benefit when added between chopping and the beginning of blooming.

The abortion of young buds and squares showing up about the start of fruiting early in June, persisting throughout the early part of the fruiting period and resulting in a very short crop in many areas throughout the section, seemed rather definitely due to some physiological condition. Physiological studies demonstrated that bolls set early in the spring grow much more rapidly than those set later, e. g., bolls collected July 23 had an average green and dry weight per boll at ages of 17, 18, and 20 days about 20 to 30 per cent greater than those of like age collected August 25. While full size of bolls is usually attained by the twenty-first day after blooming, bolls blooming on July 31 required 24 days and those blooming August 9 needed 30 days to reach the maximum size. The diameter of bolls increased most rapidly between 9 and 13 days after blooming.

Cotton varieties, J. F. O'Kelly and W. W. Hull (*Mississippi Sta. Circ. 82* (*1928*), *pp. 6*).—Varieties (E. S. R., 59, p. 827) leading in average acre yields of lint during the period 1924-1928 were Cleveland 54, Cook, Piedmont-Cleveland, D. & P. L. No. 4, and Half-and-Half, and when ranked as to acre value the order of the leaders was D. & P. L. No. 4, Cleveland 54, Delfos 6102, Coker-Cleveland, and Piedmont-Cleveland. D. & P. L. Nos. 8 and 6 and Delfos Nos. 6102 and

911 led in value the varieties tested in 1928. Certain D. & P. L. strains and Express strains led similarly in the wilt-resistance test.

Results of cotton variety demonstrations, 1928, P. H. KIME and S J. KIRBY (*North Carolina Sta. Agron. Inform. Circ. 20 (1929), pp.* [2]+3).—The higher yielding cottons normally stapling from 1 to 1 1/16 in., such as Mexican and certain Cleveland strains, were more profitable than varieties with shorter staple and are indicated for light to medium soils. For heavy, poorly drained soils the earlier, lighter foliaged sorts, e. g., Carolina Foster, seemed better adapted.

The quality and yield of cotton as influenced by fertilizers and soil type, J. J. SKINNER (*North Carolina Sta. Agron. Inform. Circ. 21 (1929), pp. 5*).—Significant observations are reported from experiments in cooperation with the U. S. Department of Agriculture, wherein the response of cotton in growth and in yield and quality of lint when receiving fertilizers containing varying proportions of phosphorus, nitrogen, and potassium was studied on important soil types in North Carolina.

Potatoes (*Ohio Sta., Dept. Hort., Expt. and Research Work, 1927, pp. 13–17, figs. 2*).—Experiments described in these pages include those already noted (E. S. R., 60, p. 135) and tests of storage conditions for seed potatoes.

Certified Irish potato seed: Report of 1928 test, H. H. WEDGWORTH, W. S. ANDERSON, and H. F. WALLACE (*Mississippi Sta. Circ. 80 (1928), pp. 7*).—Comparative trials during 4 years showed certified seed potatoes to prove superior to uncertified seed in every test. Certified Triumph seed averaged 120 bu. and uncertified seed 84 bu., while certified Irish Cobbler made 164 bu. and uncertified 128 bu. A difference was noted in the quality of certified seed produced by individual growers within a State.

Experimental methods and the probable error in field experiments with sorghum, J. C. STEPHENS and H. N. VINALL (*Jour. Agr. Research* [*U. S.*], *37 (1928), No. 11, pp. 629–646, figs. 9*).—A statistical study was made on the green weights at maturity of 2,000 rod-rows of a selected uniform strain of feterita grown at the Chillicothe (Tex.) Substation. The distribution of weights of 1,920 of these rod-row plats with borders excluded formed a frequency polygon of the approximate shape of a normal curve. Plat variation as measured by the probable error of a single plat in percentage of the means was determined for rod-row plats and for larger plats composed of various combinations of rod-rows.

While with a single rod-row or 1/60-acre plat the probable error was 10.607 per cent, this was reduced consistently by taking successively larger plats of the same general shape, the error of a 2/5-acre plat being 3.204 per cent. One shape of plat seemed to have no particular advantage over another, possibly due to the nature of the field. Systematic replication was effective in reducing error, yet the reduction was irregular. The error found was often considerably less than that expected from a random distribution of the same number of plats. The error was reduced about as much when the area of land was increased in proportion to the size of the unit plat or in proportion to the number of replications as when it was determined from the whole block. The experimental results are held to show that 3 or 4 replications of 1/40-acre or 1/80-acre plats will give results reliable enough for the ordinary test of sorghum.

New varieties of grain sorghums, H. H. FINNELL ([*Oklahoma*] *Panhandle Sta., Panhandle Bul. 1 (1929), pp. 4–7*).—Yellow Straight Neck (Fargo or Straightneck milo) supposedly derived from milo×kafir, Bishop (Algeria) and Desert Bishop, both from a cross between kafir and milo, and Beaver milo derived from (kafir×milo)×milo are described briefly, and their grain and forage yields are tabulated in comparison with those of Dwarf Yellow milo and Dwarf Blackhull white kafir.

Topping and suckering practices as related to the yield and quality of Havana seed tobacco, N. T. Nelson (*Connecticut State Sta. Bul. 297 (1928), pp. 97–110, fig. 1*).—Experiments during 1925, 1926, and 1927 gave indications that the early bloom period is the best time to top Havana seed tobacco, both for yield and quality of leaf. High topping at the internode above the spike sucker, leaving about 18 leaves on the plant, increased the percentage of short, cheaper darks, and promoted production of dark tobacco in the parts nearer the base of the plant. Low topping, at 3 or 4 leaves below the spike sucker, gave better quality than high topping, stimulated the growth of the lower 9 to 11 leaves, and had a marked beneficial effect on the burn.

A regional distribution of grades was noted, the plant tending to produce darks and mediums in the upper leaves and lights and seconds in the lower portion of the plant. Suckering more than once seemed to result in higher yields but with high percentages of heavy dark leaf. Actively growing suckers are held to aid in removing from the leaf substances detrimental to quality.

HORTICULTURE

[Horticultural investigations at the Alaska Stations], H. W. Alberts (*Alaska Stas. Rpt. 1927, pp. 6–9, 10–13, 14, 21, figs. 3*).—This report as usual (E. S. R., 58, p. 434) consists primarily of information upon the results of varietal and cultural tests.

Of the 30 varieties of apples under trial at the Sitka Station Yellow Transparent is deemed best on account of its early maturity. Keswick produced the most fruit per tree. The apples of all varieties were more elongated than those of the same varieties as grown in the eastern United States. Pears failed to ripen, but peach trees, Alexander and Triumph, trained against a building bore some mediocre fruits. Plums fruited but failed to ripen. Of several varieties of cherries, all of which fruited, the Montmorency was the most productive and was of excellent quality. Republican was the best yielder among the sweet cherries. Some cracking injury was recorded on cherries. The Cuthbert raspberry, the Holland red currant, Prince of Wales black currant, the White Dutch white currant, the Champion gooseberry, and the President Harding strawberry were the most productive in their respective groups.

Excellent success attended the culture of all hardy species of vegetables, and many types of flowers, both annual and perennial, flourished.

At the Matanuska Station strawberries survived the winter without other protection than snow. Only 20 per cent of the apple seedlings planted at this station in 1926 survived the subsequent winter.

[Horticultural investigations at the Delaware Station] (*Delaware Sta. Bul. 158 (1928), pp. 29–34*).—Further data are presented by L. R. Detjen and G. F. Gray (E. S. R., 58, p. 435) on the results of genetical studies with cabbage. A study of crosses involving annual flowering types led to the suggestion that blooming is governed by genetic factors but subject to environment. Success was obtained in an attempt to isolate annual and biennial types from a hybrid progeny. Crosses between winged and clear petiole types suggested that more than two sets of factors are concerned in this character. Heading was apparently dominant over nonheading, and the form of head was governed by more than one pair of factors. The progeny of a dwarf plant in the F_2 of Zinnia × Late Cauliflower was all dwarfs. The size of head in the F_1 closely followed the larger parent.

Reporting on the results of a qualitative study of nitrogen fertilizers for the peach, Gray, C. A. McCue, and Detjen state that two treatments, tankage and a half and half nitrate of soda and ammonium sulfate, were outstanding. A cowpea cover crop without added nitrogen gave favorable results, the yield being only 5.4 per cent less than that of the two leading treatments and 4.2 per cent greater than that of nitrate alone.

Preliminary results secured by F. S. Lagassé in a study of the effect of different nitrogen fertilizers on fruit bud differentiation in the peach indicated that the form of nitrogen has some influence on the time of differentiation. Rape, rye, and vetch and rye were found to be poor, and cowpeas, soy beans and rye, and crimson clover good cover crops for apple and peach trees on sandy soils. Some indication was obtained that fertilizers increased the resistance of peach buds to low temperature.

The Lily of Kent apple was found by Lagassé to be self-sterile but adequately pollinated by Scarlet Pippin, Yellow Transparent, Delicious, or Grimes, with Jonathan and Nero poor pollinizers. Champlain, also self-sterile, was pollinated satisfactorily by Rome, Delicious, Scarlet Pippin, Jonathan, and Yellow Transparent.

[Horticultural investigations at the Montana Station], F. M. HARRINGTON, C. C. STARRING, and W. E. POLLINGER (*Montana Sta. Rpt. 1927, pp. 39–42, 44–47*).—A general report dealing largely with the results of varietal and cultural tests with small fruits and vegetables.

A continuous supply of cabbage was obtained both by planting early varieties in succession and by planting early and late varieties at one time. Inconsistent results were secured in comparing hotbed and greenhouse grown cabbage and cauliflower plants. Celery plants set in the field on May 25 developed more premature seed stalks than did those set June 14. The use in the greenhouse of soil of low fertility apparently offset the deleterious effect of high temperature in inducing seed stalk formation in celery. The source of seed had a striking differential effect on premature seeding; for example, in Golden Self Blanching there was found a difference of 53 per cent between the high and the low strain. Using the average percentage of seeding of the several stocks as a basis of comparison, Easy Blanching was the most resistant to low temperature and White Plume and Winter Queen least resistant.

In planting tests with New York lettuce only the early crops were successful, the later ones being ruined by seeding and tipburn. Wide spacing apparently reduced the percentage of seeding. Ridging reduced seeding and increased production. Some evidence was obtained that muriate of potash alone or combined with superphosphate (acid phosphate) increased lettuce yields. Frequent heavy irrigation proved harmful. Variation was observed in the New York, Iceberg, and Salamander varieties.

Rolling the tops or cutting part of the roots failed to increase onion yields. Plant selection gave better results with Bonny Best than with Earliana tomatoes, the greatest benefit consisting in earlier maturity. With tomatoes grown to a single stem the removal of the lower shoots increased the percentage of No. 1 fruits with only a slight reduction in yield. Pruning as compared with no pruning increased the percentage of No. 1 fruits on standard single-stem plants by from 16 to 29 per cent. Tomato plants started from seed sown directly in pots on May 1 were as productive as transplants sown one month sooner. The size of pot had an apparent effect on the percentage of early ripe and No. 1 fruits. Frequent heavy irrigations increased the total yield of tomatoes, but the maximum yield of early ripe fruits were obtained by moderate irrigation followed by no water. Complete fertilizers increased the yield of early ripe tomatoes.

In studies at the Horticulture Substation, Victor, the McIntosh apple was found partially self-sterile, so much so that better crops were obtained, especially in unfavorable years, when suitable pollinizers were present. Wealthy, on account of its hardiness, is recommended as a suitable pollinizer for McIntosh. The use of either complete fertilizer or of nitrate of soda increased the length and diameter of the terminal growth of McIntosh trees, while in one plat treated with complete fertilizer there was noted a marked improvement in color of fruits as compared with those from plats in alfalfa, nonfertilized, or treated with nitrate of soda. The Latham raspberry was found of superior merit. The spring growth of red raspberries was checked by delayed pruning. Raspberry plants distributed in the row gave better results than when confined to hills. The size of raspberries was, within certain limits, increased by heading, but severe heading decreased yields.

White clover, on account of its shallow rooting and consequent drought injury, did not prove a desirable cover crop for apple orchards. Domestica plums apparently lacked sufficient hardiness, while the Hansen hybrids survived extreme conditions. Head lettuce sown directly in the field did best as a fall crop. Tests of onion seed and onion set production gave promising results.

Experimental and research work in horticulture (*Ohio Sta., Dept. Hort., Expt. and Research Work, 1927, pp. 1–20, figs. 4*).—Designed to serve as a handbook for the visitor (E. S. R., 60, p. 140), this pamphlet in addition to presenting a list of recommended varieties of fruit for commercial planting discusses the various experiments under way, summing up the results to the present time. The work with potatoes is noted on page 735.

[Horticultural investigations at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1925–26, pp. 74, 75, 83–89, 127, 128, 129*).—A progress report covering the two years ended June 30, 1926 (E. S. R., 55, p. 643.)

Work on the development and action of spray spreaders, a detailed report of which was noted (E. S. R., 54, p. 337) is again cited. Marked variation was found in the capacity of various mineral oils to form emulsions by the cold process. In the case of protein emulsions quality and stability were markedly influenced by the presence of certain reaction products which remained after purification. High pressure is deemed essential in emulsification, and protein agents such as casein, skim milk, and hard wheat flour should be brought into solution to yield the best results.

A self-fertile strain of Montmorency cherry was discovered by L. A. Fletcher. Progress is reported on the strawberry breeding project, certain promising seedlings being distributed to growers for final trial. In a study of the cause of low vigor and low yield in Italian prunes near Salem preliminary observations suggested that inadequate pruning was a factor.

Studies in tomato pollination in the station greenhouses suggested the importance of thorough hand pollination. Varieties differed in their natural capacity to set fruit. Heavy, solid heads from improved strains of late cabbage had 26 per cent less core formation than did light heads from inferior strains. A strain test of New York lettuce showed a variation of from 88 to 40 per cent of marketable heads.

Investigations conducted at McMinnville indicated that the successful drying of walnuts is dependent upon temperature, humidity, and air circulation. Tests of four types of driers, the Oregon tunnel, kiln, recirculated Oregon tunnel, and recirculated bin, showed that at 95° F. 52, 49, 38, and 30 hours, respectively, are required for drying. An increase in temperature of 5° reduced the drying time by at least 2 hours. At 120° there occurred a splitting of the shells but no marked loss in flavor.

Pear breeding studies conducted at the Southern Oregon Substation at Talent yielded seedlings possessing vigor and a high percentage of blight resistance from crosses between the immune Chinese varieties and high quality

American pears. Extensive studies conducted to determine parental combinations which would yield desirable seedlings for stock purposes gave positive results. For example, it was found that the Ba Li Hsiang ♀×Lo Suan Li ♂ yielded superior seedlings. Highly promising strains of Bosc and Winter Nelis pears possessing unusually attractive russet color and a very dark strain of Spitzenberg (Esopus) apples were discovered.

[Horticultural investigations at the Hood River, Oreg., Substation] (*Oregon Sta. Bien. Rpt. 1925–26, pp. 121, 122, 123*).—In this progress report (E. S. R., 55, p. 643), nitrate nitrogen was found to be present in larger quantities during midsummer than in early spring in typical Hood River soils. Differences in nitrate nitrogen content as observed in early spring from year to year were apparently correlated with the weather. The finding of considerable quantities of nitrate nitrogen in the soil as late as February showed a marked persistency of this form of nitrogen. Comparisons showed lower nitrate nitrogen content under alfalfa of long standing than in soils where the hairy vetch and clean tillage type of soil management was practiced or where alfalfa had been plowed under and followed by cultivation.

Phosphorus or potash used alone or in combination failed to yield profitable returns in bearing apple and pear orchards. Nitrate of soda and sulfate of ammonia were outstanding in practical results. However, on Hood silt soil three successive annual applications of fertilizer failed to influence materially yield or quality. Quick growing cover crops were favored. Alfalfa exerted a retarding influence on the growth of young trees, probably because of its influence on nitrate nitrogen.

The topping of strawberry plants was most successful when performed within 2 or 3 weeks following harvest. Fall proved a better time than spring for applying manure supplemented with commercial fertilizer to red raspberries.

Investigations with bearing Yellow Newtown apple trees which were growing in alfalfa and had never fruited heavily failed to show striking results from pruning and fertilization. Heavy annual spring pruning was harmful, apparently by reducing the total number of fruit spurs. Unpruned Anjou pear trees made greater growth and produced a larger number of fruit spurs and more fruit than did pruned trees. Trees with their limbs tied down to a horizontal position fruited more abundantly than did pruned trees.

Severe winter injury to bearing apple and pear trees suggested the desirability of hardy rootstocks. The Comice and Easter pears were unusually hardy, while the Japanese type of pear had no apparent value as a stock. The Mammoth Black Twig apple proved to be a hardy stock.

[Horticultural investigations at the Porto Rico Station], D. W. May, T. B. McClelland, R. L. Davis, and H. C. Henricksen (*Porto Rico Sta. Rpt. 1927, pp. 7, 8, 11–13, 15, 16, 17, 19–24, figs. 3*).—The usual annual report (E. S. R., 58, p. 536).

Analyses of banana plants showed that potash occurs in unusually large percentages, varying with varieties. For example, the Gigante, Manzano, Señorita, Morado, Chamaluco, and Enano varieties contained 2.89, 1.8, 3.7, 4.02, 1.83, and 12.17 per cent of potash, respectively, in their dry matter. Potash content was evidently associated with disease resistance, since the Enano variety with a high potash content was immune and Chamaluco with a low potash content was susceptible to certain fungus diseases which attacked the other varieties in varying intensity. Potash applications encouraged new growth of suckers, while plants without additional potash quickly succumbed.

Length of light exposure had a strong influence on bulb formation in the onion. The White Bermuda, Prizetaker, Yellow Globe Danvers, and Giant White Tripoli failed to develop bulbs under short day conditions. Little difference was noted in the growth of the pineapple during the first 9 months of differential light exposures, but later observations indicated that the longer period was more favorable to vegetative development, blossoming being delayed and larger fruits forming than under the normal or short day lengths. Blossoming from suckers was also retarded by long day exposures. Some effect, varying with varieties, was noted on white potatoes. Increasing the length of day beyond the normal period delayed tasseling, favored vegetative development, and decreased the production of ears in corn. No pronounced effect on young coffee plants was observed during 7 months' treatment with different light exposures.

Complete fertilizer proved most valuable for coffee, and *Gliricidia sepium* proved highly satisfactory as a shade plant for coffee. Coconut palms treated with sodium chloride yielded less than did check trees. In tests at Corsica potash gave favorable results on the coconut. A study of seedlings of the Cambodiana mango, a polyembryonic variety, failed to show that seedling size and vigor could be used as an index to hybridity. Plants of *Oncoba echinata*, S. P. I. 55465, fruited freely at 3 years of age.

A brief account is given by Davis of a sweet corn, Mayaguez-1, a selection from a native field corn, which, contrary to the behavior of introduced varieties, resisted insects and yielded small ears of good quality. The results of extended studies on the physiology and growth of the pineapple are reported by Henricksen, who discusses in some detail the comparative structure and chemical composition of normal and abnormal plants and the effects of various fertilizer elements. Sulfur applied in large quantities aided materially in the control of nematodes in pineapple fields.

Experiments with fruits and vegetables (*South Carolina Sta. Rpt. 1928, pp. 59–62*).—Apple pollination studies continued from the preceding year (E. S. R., 58, p. 639) again showed that Delicious, Winesap, Stayman Winesap, Arkansas, and Golden Delicious are not self-fruitful and that Early Harvest, Rome, and Red June are only partially so. Delicious proved an effective pollinizer for Stayman Winesap, Arkansas, and Winesap.

In peach fertilizer studies trees receiving abundant nitrogen suffered less defoliation from bacteriosis, the trees to which sulfate of ammonia was applied in early spring being most resistant. In variety tests some of the New Jersey Stations' seedling peaches appeared highly promising. The Weaver peach was found of value for the home orchard.

Studies in asparagus fertilization indicated that nitrogen, phosphorus, and potash are all required to produce maximum yields. Heavy fertilizing following cutting gave consistently better results than fertilizers applied before cutting. Time of cutting tests indicated the advisability of delaying the initial cutting until the second year after planting. The total yield for three years beginning the second season was larger than that of four years beginning the first. The average annual yield for the three years was notably larger with close planting, 3 by 2 ft., than with wider spacing.

[**Horticultural investigations at the Western Washington Station**], H. D. Locklin (*Western Washington Sta. Bul. 10–W (1928), pp. 16–21, fig. 1*).—For young, vigorous grape vines a total of 60 buds per plant carried on 4 canes was found very satisfactory, but it is conceded that with older vines this number might have to be reduced. The four-arm Kniffin system, followed closely by the Munson, proved best in a 5-year study. A table of dates covering the successful treatment of narcissus bulbs with hot water to control bulb fly is offered. Progress is recorded in the breeding of blackberries, raspberries, and strawberries. Wheat and vetch proved a satisfactory cover crop combination for raspberries and grapes, but the vetch yielded such a small percentage of the total weight that its inclusion is questioned. A comparison of five different systems of culture for red raspberries showed no outstanding differences.

In studies with lettuce the differential effect of fertilizers on the amount of slime rot was very noticeable. On sandy soil the cow manure and lime plat had the least rot and the nitrogen-phosphoric acid plat the most. On muck soil the potash plat had the least and the complete fertilizer-lime plat the most rot. Slime rot was generally less prevalent on muck than on sandy soil. The lettuce heads were heavier on muck but not as solid.

Truck crop experiments at the Washington County Truck Farm, Marietta, and the Central Experiment Station, Wooster (*Ohio Sta.* [*Pamphlet*], *1927, pp. 8, figs. 4*).—This pamphlet, designed as a visitors' guide, presents in a brief manner the outstanding results of variety, cultural, and fertilizer tests, and lists the projects under way.

Nitrate assimilation by asparagus in the absence of light, G. T. NIGHTINGALE and L. G. SCHERMERHORN (*New Jersey Stas. Bul. 476* (*1928*), *pp. 24*).—A further report (E. S. R., 56, p. 344) upon nitrogen utilization in the asparagus plant.

Chemical analyses of young Martha Washington asparagus plants grown with and without nitrogen in light and in continuous darkness suggested that this species is able to assimilate nitrates in the absence of light. This was further substantiated by the fact that in darkness the entire root system and rhizomes of the plus nitrate plants decreased about 65 per cent more in absolute amount of carbohydrates than did comparable plants without an external nitrogen supply. The asparagus plants in darkness continued to assimilate nitrates until the available carbohydrates were exhausted and death resulted. At the same time comparable plants with no external nitrogen supply showed no signs of death.

At the close of the experimental period the absolute amount of total nitrate-free nitrogen was practically the same in the plus nitrate light and plus nitrate dark series. However, the plus nitrate light plants had a high protein and polypeptide content in the tops. The percentage of dry matter in the plus nitrate light series was almost twice that of the plants grown in darkness.

Temperature had an important influence upon the transformation of nitrates to organic forms. At 10° C. this change occurred slowly, while at 20 to 30° assimilation was quite rapid. It is believed that the storage roots and actively growing tops are able to assimilate nitrates, but rarely do so since the fibrous roots perform this function. Under low temperatures, 10° or less, nitrates were apparently translocated to all parts of the plant, but disappeared rapidly from the growing stem and storage roots with a rise in temperature.

A high quality table beet, R. MAGRUDER (*Ohio Sta. Bimo. Bul., 14* (*1929*), *No. 1, pp. 24, 25, fig. 1*).—Known under various names, Long Season, The Century, etc., this beet is recommended on account of size, color of flesh, table quality, etc. Unfortunately the roots are top shaped and bear side branches.

Early sweet corn variety tests, 1928, R. MAGRUDER (*Ohio Sta. Bimo. Bul., 14* (*1929*), *No. 1, pp. 18–23*).—Notes are given on the results of tests of white and yellow sweet corns. Banting was the first ripe yellow variety but bore the smallest ears of the 13 yellow kinds tested.

Effect of sunshine and shape of fruit on the rate of ripening of tomato fruits, C. L. BAKER and H. D. BROWN (*Plant Physiol., 3* (*1928*), *No. 4, pp. 513–515*).—A correction in authorship of the abstract appearing under the same title (E. S. R., 60, p. 439).

A standard for estimating the twig growth of one-year-old peach trees, M. A. BLAKE and G. W. HERVEY (*New Jersey Stas. Bul. 475* (*1928*), *pp. 24,* *figs. 8*).—A study of measurements taken on the annual growth of a large number of 1-year-old peach trees showed a marked interrelationship between the total number of twigs, the number of twigs over 24 in., and the total annual growth. From this relationship a ratio is established by which twig growth may be quickly estimated once the total number of twigs and the total number of long branches are known. Measurements taken on 132 Carman, Elberta, and Stump trees prior to the advent of the oriental peach moth are given as standards of vigor for New Jersey peaches. These standards are deemed reasonably accurate for such varieties as Hiley, Belle, Salberta, Iron Mountain, Cumberland, Eclipse, and Golden Jubilee. The effect of the peach moth in shortening growth and thereby reducing the number of long branches was offset by reducing the requirements of the long shoot group to 23 in. for injured trees. The application of the method is restricted to trees which have made only one season's growth in the orchard.

FORESTRY

[Forestry at the Montana Station], I. J. JENSEN (*Montana Sta. Rpt. 1927, pp. 42, 43*).—In studies at the Judith Basin Substation with shelter belt species the Siberian pea, box elder, and green ash proved to be hardy and vigorous growers under dry land conditions. The Northwestern poplar was found of value on account of rapid growth but is not universally recommended because of a very short life. Thorough preparation of the soil, supplemented with cultivation during the early life of the shelter belt, was found of utmost importance. Rows from 10 to 12 ft. apart with trees from 5 to 6 ft. in the row are recommended. Moderate pruning gave good results.

Reforesting, D. W. MAY (*Porto Rico Sta. Rpt. 1927, pp. 2, 3*).—Mahogany is suggested as a valuable tree for reforestation, and various legumes which have proved useful as nurse crops for mahogany and other forest trees are listed.

Analyses of the oil of *Aleurites fordii*, *A. moluccana*, and *A. trisperma* are reported. All three species produce hard-drying oils which are suitable for lacquer making, and their growing on a commercial scale in Porto Rico is advocated.

The forestry question in Great Britain, E. P. STEBBING (*London: John Lane, 1928, pp. VIII+217*).—A general discussion of the history, development, and present status of the forestry problem in Great Britain.

Note on weights of seeds, S. H. HOWARD, rev. by H. G. CHAMPION (*[Indian] Forest Bul. 41, rev. (1928), pp. [1]+21*).—In this revised edition (E. S. R., 49, p. 141), tabulated data are presented on the number of seeds and fruits and the expected number of seedlings per given weight for a large number of Indian forest species.

Effect of thinnings in sapling Douglas fir in the central Rocky Mountain region, J. ROESER, JR. (*Jour. Forestry, 26 (1928), No. 8, pp. 1006–1015, fig. 1*).—Studies at the Fremont Field Station, Colorado, and in the Jarre Canyon, about 30 miles southwest of Denver, led to the suggestion that the degree of thinning young Douglas fir stands is largely subject to the purpose for which grown. For Christmas tree production wide spacing is recommended, since this removes a large number of trees, gives a large financial return, and insures rapid and desirable growth in the remaining trees. For production of ties moderate thinning is suggested. Thinning was found to check the spread of an unidentified bark disease, pitch girdle, which in the check plats attacked as high as 76 per cent of the trees.

Yield, stand, and volume tables for red fir in California, F. X. SCHUMACHER (*California Sta. Bul. 456 (1928), pp. 29, figs. 9*).—Based on studies made in well-stocked stands, normal yield, volume, and stand tables are presented for red fir, *Abies magnifica*, a species usually occurring at elevations of from 6,000 to 9,000 ft. Appended are the basic data and methods of computation, including the analysis for abnormalities, the effect of plat area, construction of the stand tables, and relationships within the stand.

Yields of Funtumia rubber on experiment stations, 1906–1928, G. H. Kady (*Gold Coast Dept. Agr. Bul. 14 (1928), pp. 26, pls. 3, figs. 13*).—Investigations with *F. elastica*, an indigenous forest tree occurring throughout the rain forest of the Gold Coast and Ashanti and said to yield a high grade of rubber comparable to the best Para, showed that this species can not compete with Para rubber as a plantation subject. The highest calculated yield of dry rubber per acre was only 58 lbs. for Funtumia as compared with 400 lbs. for Para from trees of the same age. Furthermore, the subsequent yield from Funtumia trees annually decreased, while that of Para increased. The only point in favor of Funtumia was that over 50 per cent of the total yield was obtained at the first tapping.

The budding of Hevea in modern plantation practice, F. Summers (*Rubber Research Inst. Mayala, Planting Manual 2 (1928), pp. III+100, pls. 3*).—A discussion of the principles and practices of budding of Hevea as developed in the light of scientific investigation.

Commercial volume tables for sal (Shorea robusta) in the wet mixed forests of the Bengal Duars, P. Nand Suri (*Indian Forest Rec., 13 (1928), No. 3, pp. II+25, pls. 3*).—Tables are presented.

Volume tables for sundri (Heritiera fomes, Buch. syn. Heritiera minor, Roxb.) in the Sundarbans, Bengal, P. Nand Suri (*Indian Forest Rec., 13 (1928), No. 4, pp. II+49, pls. 5*).—Tables are presented.

The air seasoning of western softwood lumber, S. V. Fullaway, jr., H. M Johnson, and C. L. Hill (*U. S. Dept. Agr. Bul. 1425 (1928), pp. 60, pls. 8, figs. 10*).—A discussion of approved methods for air seasoning western softwood lumber, including a review of the general principles of wood drying and their application to yard drying. Specific recommendations are given for improving drying practices in the Inland Empire and in the California pine, redwood, and Douglas fir regions, each of which has its distinct problems.

DISEASES OF PLANTS

[Plant disease investigations at the Connecticut State Station] (*Connecticut State Sta. Bul. 298 (1928), pp. 122–125, 127, fig. 1*).—Experiments on the control of mosaic of Cuthbert raspberries did not demonstrate the practicability of roguing for the control of this disease.

Infection of tobacco plants with white-pickle mosaic of cucumbers is said to have produced leaf mottling, but plate crystals were not found in the mottled leaves and infection tended to disappear in the new growth.

In a planting of about 1,300 young chestnut trees to test their survival to attack of chestnut blight, about one-half of the trees died from unfavorable conditions but none from blight.

Considerable time was given to a study of willow scab or blight caused by *Fusicladium saliciperdum*. The distribution of the fungus, species of willow attacked, and the extent of the injury done were determined. Successful spraying experiments were conducted for the control of this disease.

In a cooperative experiment between the botanical and forestry departments, preliminary results are said to indicate that calcium chloride such as is used for roadways is not injurious to spruce trees unless present in a solution containing more than 5 per cent of the compound.

Department of plant pathology, J. F. Adams and T. F. Manns (*Delaware Sta. Bul. 158 (1928), pp. 34–43*).—In continuation of studies of pox disease of sweet potatoes (E. S. R., 58, p. 441), *Actinomyces P* was found in all lesions produced by inoculation experiments. A comparison of this form with other species of Actinomyces is in progress.

Negative results were obtained in experiments on the transmission of the supposed viruses of peach yellows and little peach by leafhoppers, tarnished plant bugs, peach curculio, and the black peach aphid.

In experiments on the seed bed control of black rot and other sweet potato diseases, formaldehyde, 1 lb. to 30 gal. of water, applied at the rate of ⅛ gal. per square foot of seed bed is said to have given excellent control. In comparisons of corrosive sublimate treatment of old and new soil in seed beds, the results were largely in favor of new soil. Laboratory experiments showed the superiority of corrosive sublimate over other fungicides in destroying bacteria and fungi in seed bed soils.

Seed treatment of soy beans with organic mercury compounds did not control Septoria leaf spot. Treating cowpea seed with similar products was of no avail as shown by the identical presence of Cercospora and Amerosporium foliage diseases on both treated and untreated lots.

Summer applications of a number of fungicides did not control the bacterial spot on Elberta peaches. Experiments made with a number of fungicides to determine the necessity of late applications are said to have shown that spraying is necessary throughout the growing season for the control of bacterial spot of plums. Observations under greenhouse and field conditions gave no evidence that bacterial spot was carried over in the buds of Elberta peach trees.

Investigations on the initial source of infection of cucurbits by leaf blight and downy mildew offered no evidence to indicate that the diseases were seed borne, nor was there any indication that the previous crop had any relation to the prevalence of these diseases. The increased use by growers of copper-lime dusts for the control of these diseases is reported.

Experiments with various fungicides for the control of fruit spot (*Phoma pomi*) of apples are said to show that sulfur sprays can not be depended upon. Bordeaux mixture was found to be effective, but it is said to be undesirable on account of its tendency to cause russeting of the fruit.

Bunt of wheat was greatly reduced by treatment of the seed with a copper carbonate compound. The practice of treating wheat before sowing has greatly increased within the State during the past three years.

The department of botany and bacteriology, H. E. Morris and P. A. Young (*Montana Sta. Rpt. 1927, pp. 84–87*).—Summer-strength lime-sulfur solution applied when the buds were in the pink, when two-thirds of the petals had fallen, and later at intervals of 2 and 4 weeks is recommended for the control of apple scab. Omitting the pink spray in several instances is said to have resulted in serious losses.

Studies were made of the losses in yield of potatoes through some of the virus diseases. Crinkle mosaic is said to have reduced the yield of Bliss Triumph by 34.2 per cent and spindle tuber by 53.4 per cent. The yield of Netted Gem was reduced by 75.9 per cent by spindle tuber. Witches'-broom of potato is claimed to have been successfully transmitted to tomato plants by inoculation. A serious disease was produced on tomatoes that is not the same as the yellows or northwestern blight, which is caused by the virus of sugar beet curly top.

Crinkle joint of wheat reported in 1926 is briefly described. It is characterized by a breaking of the culm, usually between the second and third nodes, in most instances nearer the second, with the remaining upper nodes bent or misshaped.

The heads of these broken straws usually yield from 75 to 90 per cent of a full crop, but on account of their position many of them are missed by the binder.

The factor underlying or causing the original crinkle has not been determined, but from the available data the authors suggest that it is due to an abnormal growth rather than to a diseased condition.

In 1927, a season favorable for the propagation of the black stem rust of wheat, estimated losses in the State were only 0.1 per cent as compared with 10.5 per cent in 1916. This reduction is attributed to lessened primary infection through the extensive destruction of barberry bushes. In August there was a widespread and general infection of black stem rust over the eastern third of the State, but the wheat was beginning to ripen at that time and little damage was done.

Department of botany and plant pathology (*Oregon Sta. Bien Rpt. 1925–26, pp. 90–96*).—Of the virus diseases of potatoes known to occur in Oregon, rugose mosaic is said to spread most rapidly, and it is the most difficult to control. Roguing reduced but did not eliminate the disease. Tuber indexing for the production of seed stock is recommended.

A mild form of mosaic on brambles is reported. Streak of black raspberries is said to be masked under Oregon conditions, and only a slight mottling of the leaves occurs early in the spring, with very little streaking of the canes. Blackberry dwarf was transmitted to loganberry plants by aphids from *Rosa rubiginosa* that had fed on infected loganberry plants. Webbing, penciling, and attenuated leaves, especially of black raspberries, are briefly described, but they are not believed to be virus diseases.

The hot water method of controlling the narcissus nematode is described, and a mosaic disease of narcissus is reported. Roguing is said to have reduced the percentage of plants affected with tulip fire, a fungus disease carried in the bulbs, and mosaic, which is said to be the cause of the condition of tulips known as "breaking."

Attention is called to the undesirability of rotating black raspberries and potatoes on account of *Verticillium alboatrum* attacking both host plants. *Phragmidium imitans* is said to be serious in its attack on Cuthbert raspberries, and low cutting of old canes, plowing under the old leaves, and burning all brush from prunings are recommended for control measures.

A disease of strawberries called crinkle, believed to be of a virus type, and witches'-broom are reported on certain varieties in the State.

Gooseberries sprayed with lime sulfur, or dusted with sulfur, were found to cause swelling of cans, while similar fruits sprayed with various brands of Bordeaux mixture, or with sodium carbonate, or with a commercial copper-lime dust did not cause swelling of the cans. Experiments with cherries gave similar results with sulfur dust, but Bordeaux mixture gave no trouble with fruit that had been canned for eight months or more. These experiments are held to indicate that there is some danger from the application of sulfur to the fruit unless it is washed off, but very little or no danger from the use of Bordeaux mixture.

A bacterial disease of tomatoes is briefly described, and inoculation experiments showed that the organism is weakly parasitic.

Studies of the distribution of the stomata of species of Ribes are believed to indicate that *R. nigrum*, *R. sanguineum*, and *R. divaricata* are susceptible to infection by the white pine blister rust in the order named.

Comparisons of copper-lime dust and Bordeaux mixture spray are said to indicate that there was very effective control of apple-tree anthracnose by the liquid application, but little or none by the use of the dusts.

[Plant disease investigations at the Hood River Substation] (*Oregon Sta. Bien. Rpt. 1925–26, p. 119*).—Spraying with Bordeaux mixture is reported to have reduced apple-tree anthracnose, regardless of the time of application. A 6–6–50 Bordeaux mixture used as a dormant spray effected fair control, even when the disease did not appear until fall. Summer spraying with Bordeaux mixture, to which lead arsenate was added, effectively controlled the disease.

Bordeaux mixture did not prove satisfactory for the control of perennial canker. Winter injury is believed to be correlated with perennial canker, and late pruning is recommended so that rapid callus growth is promoted and protection thus afforded against fungus attack.

Report of the plant pathologist, C. M. Tucker (*Porto Rico Sta. Rpt. 1927, pp. 25–27*).—The author has continued his studies of strains of Phytophthora and reports two new host plants in Porto Rico, *Bryophyllum pinnatum* and the avocado (*Persea gratissima*). The avocado Phytophthora was isolated from the roots of a young dying tree, but no inoculations were reported with the organism.

A study by A. S Muller is reported of a root disease of citrus trees, which was said to be assuming considerable importance in several localities. The branches were dying back, the foliage was scant, and there was a more or less severe crown rot. Isolations from dying-back branches yielded a fungus that closely resembled *Colletotrichum gloeosporioides*. From diseased roots a Fusarium was isolated, but no evidence was obtained to indicate that the fungus was pathogenic.

Department of plant pathology, G. A. Newton (*Western Washington Sta Bul. 10–W (1928), pp. 21–23*).—Preliminary investigations of slime rot of lettuce are said to indicate that bacteria may not be the primary causes of the trouble but that the organisms gain entrance after injury by *Botrytis cinerea* and tipburn. Inoculations with suspensions of the bacteria from the slimy heads gave inconclusive results.

An experiment on the control of basal rot of narcissus caused by *Fusarium* sp., in which bulbs were treated with hot water and organic mercury compounds, is said to have given negative results.

As a result of a plant disease survey of the State, bacterial leaf blight of lilacs caused by *Bacterium syringae*, bacterial canker of tomatoes (*Aplanobacter michiganense*), and hyacinth yellows (*B. hyacinthi*), are reported in Washington for the first time. Nematode injury to narcissus was found in several plantings.

Formaldehyde dust for the control of oat smut, J. D. Sayre (*Ohio Sta. Bimo. Bul., 14 (1929), No. 1, pp. 9–11*).—In a previous publication a report was given by Sayre and Thomas on the use of formaldehyde dusts for the control of oat smut (E. S. R., 58, p. 650). In 1928, similar combinations were tested, and the dusts were tried in a wide commercial way. In addition to homemade mixtures, Smuttox, a commercial product in which formaldehyde is incorporated into a dust, was used. The results obtained showed almost perfect control for formaldehyde dusts and for some of the treatments with Smuttox. Germination tests showed no injury where dusts containing from 4 to 6 per cent formaldehyde were used. In the commercial field tests with Smuttox, perfect control of smut was secured in practically every case. In using formaldehyde it was claimed that 3 oz. of dust should be used per bushel of grain. This must be thoroughly mixed with the grain and the grain allowed to stand at least overnight in sacks. The cost of the treatment was approximately 15 cts. per acre.

[Oat smut control] (*Wyoming Sta. Rpt. 1928, p. 160*).—Treating oat seed with formaldehyde is said to have resulted in a crop practically free from smut as compared to one showing approximately 38 per cent infection where no treatment was used.

Some chemical and morphological phenomena attending infection of the wheat plant by Ophiobolus graminis, H. Fellows (*Jour. Agr. Research [U. S.], 37 (1928), No. 11, pp. 647–661, pls. 2, figs. 5*).—A report is given of studies made to determine what tissues of the wheat plant are invaded by the fungus *O. graminis* and the morphological changes produced, the data to be used in the interpretation of the behavior of wheat plants affected with take-all disease. The results are believed to have a bearing on the explanation of resistance to disease, if such plants should be found.

Effectiveness of 50 per cent copper carbonate in controlling stinking smut, C. McKee L. Powers, and J. E. Norton (*Montana Sta. Rpt. 1927, p. 13*).—Cooperative experiments in 8 counties are reported to show the superiority of a high grade of copper carbonate for the prevention of stinking smut of wheat. Wheat treated with an 18 per cent product showed an infection of 15.99 per cent of smut as compared with 4.62 per cent for wheat treated with a 50 per cent grade. Untreated wheat in these experiments averaged 34.38 per cent more smutted heads than that treated with an 18 per cent grade of copper carbonate and 45.75 per cent greater infection than the wheat treated with a 50 per cent grade. Some of the untreated plats are said to have contained as high as 84 per cent of smutted heads.

Corn seed treatment experiments, H. H. Wedgworth, E. B. Ferris, H. F. Wallace, and H. A. York (*Mississippi Sta. Circ. 81 (1928), pp. 3, fig. 1*).—A popular report is given of tests with various organic mercury disinfectants for the control of seed-borne diseases of corn. The results of the experiments are said to indicate that where precautions are taken to select sound ears of corn for seed purposes there is little or no benefit to be derived from treating such seed with organic mercury disinfectants.

Relation of cotton root rot and Fusarium wilt to the acidity and alkalinity of the soil, J. J. Taubenhaus, W. N. Ezekiel, and D. T. Killough (*Texas Sta. Bul. 389 (1928), pp. 19, figs. 5*).—A report is given of studies of the influence of the soil and artificial media reaction to the growth of the cotton root rot organism (*Phymatotrichum omnivorum*), and on the possibility of developing practical control measures for use under field conditions. In connection with these studies similar data were collected for the cotton wilt fungus, *Fusarium vasinfectum.*

Laboratory studies are said to have shown that the root rot fungus made its maximum growth at about pH 7.0 and that it was inhibited at an acidity of pH 4.1 and at an alkalinity of pH 8.9.

Cotton fields were examined in 16 counties in Texas for the occurrence of root rot and Fusarium wilt, and it was claimed that the presence or absence of the diseases was correlated with the H-ion concentration and the basicity of the soil. Root rot was found in soils with pH 5.5 to 9.0, the higher percentage of the cases being observed in the neutral or alkaline soils. On the other hand, the Fusarium wilt was found most abundant in acid soils, with only a few cases where the soil was nearly neutral, and in only two instances was Fusarium found present in alkaline soils.

It is believed that the distribution of the diseases in Texas can be attributed in part at least to differences in soil acidity.

Whether the results obtained can be used as a basis for field control must be determined by further experiments. Attention is called to the probability that changing the soil reaction, while possibly detrimental to one organism, might favor the development of the other.

Spraying experiments with bush Lima beans, E. E. Clayton (*New York State Sta. Bul. 558* (*1928*), *pp. 22, figs. 2*).—A report is given of experiments conducted on Long Island during the years 1923–1928 for the control of bacterial spot (*Bacterium vignae*) and downy mildew (*Phytophthora phaseoli*) on Lima beans.

Spraying before and after blossoming prevented to a large extent the bacterial spot disease, and spraying before and after blossoming gave increased yields of 964 per cent due to the control of downy mildew. Spraying after blossoming did not result in any yield increases in the case of bacterial spot, and, while not so effective for the control of downy mildew, gave considerable increases in yield. New Jersey dry mix, copper acetate, and Uspulun were unsatisfactory sprays; the first because it failed to control and the last two because of vine injury. Bordeaux mixture 4–6–50 is said to have given excellent disease control, and it was safe to apply. Copper-lime dust was less effective than liquid Bordeaux mixture.

Spraying is said to have not appreciably discolored the pods, and it improved the appearance and keeping qualities of the beans.

Physiological dropping of fruits.—II, In regard to genetic relationship of plants, L. R. Detjen and G. F. Gray (*Delaware Sta. Bul. 157* (*1928*), *pp. 38, figs. 20*).—In continuation of studies on the physiological dropping of fruits (E. S. R., 58, p. 448), the authors give the results of their studies with particular reference to the genetic relations of the plants and physiological dropping. Investigations were made of peach, plum, and apple trees, each represented by a number of varieties, the method of study being the same as that previously described (E. S. R., 55, p. 451).

In their investigations the authors attempted to discover, if possible, any correlation existing between the shedding performances of trees of different kinds of fruits, whether the shedding performance of a tree remained stable over a period of years, and whether some environmental factor could change or modify the results ascribed to genetical differences, and to compare the stability of performance in shedding during the on and off years.

No correlation was found to exist in time or rate of shedding among the various kinds of distantly related tree fruits. The season of shedding apparently was governed by factors within each kind of fruit. The plums generally shed their greatest numbers from about the middle fo April to the latter part of May, depending on season and variety or species. The apple was found to shed its greatest numbers from the first of May to the first of June, depending also on seasonal or weather conditions. The peach variety Lola shed its greatest numbers of young fruits during the early part of June and continued over a period of about 14 days. Plum varieties were found to shed their fruits irrespective of one another, and their shedding performance records could not be compared. Different varieties of the same species, as represented by the apple, were found to shed their fruits at comparable times and rates, although some variations were noted. Different trees of a variety in the same year and locality were found to shed their fruits at about the same time and at a rate corresponding roughly to the total number of flowers on the tree. The shedding performance of each variety appeared to be governed by different factors, the manifestations of which were reasonably constant from year to year.

Environmental factors, such as soil fertility, especially nitrogen, starvation as regards all essential plant food elements, pruning, and spraying seemed to have no effect on the normal shedding performance of fruit trees. Weather conditions alone, such as governed growth, were able to influence but not seriously modify such performances.

The authors claim that the shedding of immature fruits is of deep-seated origin and seems to be governed by the genetic individuality of the trees.

Physiological drop of fruits in Delaware, L. R. Detjen and G. F. Gray (*Delaware Sta. Bul. 158* (*1928*), *pp. 24, 26–28*).—A report is given in continuation of studies on the effect of environmental factors on the physiological drop of fruits (E. S. R., 58, p. 448).

Applying nitrate to Jonathan trees 10 days before the bursting of fruit buds or when the trees were in full bloom did not affect the normal schedule of shedding of immature fruits. The total yield of fruit was increased by applications of sodium nitrate just before the buds burst and while the trees were in full bloom. The cool, wet weather in the spring of 1928 is said to have caused longer and more irregular waves of shedding fruits than on other occasions.

Studies were made on the effect of position of flowers in the cluster, and in Stayman the small percentage of central fruits formed in the cluster is attributed to low temperatures early in the spring. Frost injury of several types was observed. This is said to have appeared to a large extent on Transparent and less often on Stayman, Jonathan, and other varieties. The injury in some cases was manifested by the abortion of flower buds.

Overcoming yellowing of apple tree leaves, E. Burke et al. (*Montana Sta. Rpt. 1927, p. 90*).—From a study of chlorotic apple trees in the Bitter Root Valley it is claimed that the yellowing of the leaves is caused by a deficiency of iron in the trees. Trees so affected can be restored to their normal condition by injecting a solution of iron salts into the trunks, or by driving iron nails into them. The action of the iron nails is said to be much slower than the injection of iron salts, but as the treatment is more easily applied it is the method recommended by the station.

Blight resistance in pears (*Oregon Sta. Bien. Rpt. 1925–26, pp. 126, 127*).—In a previous publication (E. S. R., 54, p. 252) an account was given of studies of the relative blight resistance of species and varieties of pears used as stocks. Additional investigations are said to have shown that strains or varieties of *Pyrus ussuriensis* and *P. calleryana* are valuable as seedlings for stock, and studies are being continued with these, as well as with a variety of *P. communis* that is resistant to blight. Considerable difficulty has been met with in efforts to propagate root cuttings of some of the more resistant stocks.

Spraying with Bordeaux mixture immediately before and after blossoming is claimed to have reduced blight infection in Oregon.

Downy and powdery mildews of the grape and their control, F. E. Gladwin (*New York State Sta. Bul. 560* (*1928*), *pp. 14, figs. 3*).—Popular descriptions are given of the downy and powdery mildews of the grape, and as a result of several years' work it is claimed that homemade Bordeaux mixture, well made and timely applied, is the most effective spray material for use in the control of these fungi, and also the most economical. The author considers the evidence obtained to justify the conclusion that 3 applications of Bordeaux mixture 4–4–50 were equal to a mixture containing more copper for the control of downy mildew in the Finger Lakes region in most seasons, while 2 treatments controlled the severest infections of powdery mildew in southwestern New York. It is considered probable that an additional application will be required in the Niagara district.

A spreader, such as resin fish oil soap or menhaden fish oil, is desirable for the early applications, but spreaders should be omitted in the later treatments because of the probability of the presence of spray residues.

The inoculation of Pacific northwestern Ribes with Cronartium ribicola and C. occidentale, G. G. Hahn (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 11, pp. 663–683, figs. 3*).—The results are given of a series of inoculation experiments with *C. occidentale*, the cause of the piñon or nut-pine blister rust, and *C. ribicola*, the white-pine blister rust, on a dozen or more species of Ribes and Grossularia, which are native to the Pacific Northwest. No essential physiological differences were discovered between the two Cronartiums in the uredinial stage under artificial greenhouse conditions, except in one case. Immunity to *C. occidentale* was shown by *R. triste*, while it was susceptible to *C. ribicola*. The author states that practically all the northwestern species of Ribes proved decidedly susceptible to *C. ribicola*. The results obtained from inoculation experiments, taken together with what is known of the distribution of Ribes, are said to remove any chance that the western white-pine forests will escape the white-pine blister rust through the lack of susceptible alternate hosts.

[Chlorosis of cottonwood trees] (*Wyoming Sta. Rpt. 1928, p. 140*).—A study was made of the relation of soil constituents to the chlorosis of cottonwood trees, and in some cases a high lime content was found to be associated with chlorosis, while in others it was not. The direct injection of solutions of iron into the trunks of the trees did not cure the disease.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Determination of the natural undercooling and freezing points in insects, W. Robinson (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 12, pp. 749–755, figs. 3*).—It was found by the author in work at the Minnesota Experiment Station that in low-temperature studies undercooling and freezing-point determinations provide valuable data. The piercing method of making the determinations produces shock to the organism and gives inaccurate readings of temperature. A means of making determinations by contact is described, and detailed instructions are given for the construction of a contact thermocouple.

A study of the effect of surgical shock on insects, W. Robinson (*Jour. Agr. Research* [*U. S.*], *37* (*1928*), *No. 12, pp. 743–748, figs. 3*).—It was found by the author in studies at the Minnesota Experiment Station that when insects are pierced, cut, or injured an effect is produced upon them that may be analogous to surgical shock in higher animals. This is most evident in the rapid change that takes place in the water relations. Since in some physiological determinations injury to the tissues is unavoidable, the data thus obtained may not accurately represent the condition in normal individuals.

Department of entomology, H. L Dozier (*Delaware Sta. Bul. 158* (*1928*), *pp. 19–24, figs. 3*).—Reference is first made to the use of "Choice Light Pressed" Menhaden fish oil as a sticker with lead arsenate in various spray combinations in orchard and vineyard. A total of seven barrels of this material was distributed among 30 commercial apple, peach, and grape growers for testing out on a small scale in the early sprays. It was found to stick the lead arsenate on the fruit for such long periods that it is recommended with safety only for the early applications. The results obtained in the preliminary work give promise of its being a cheap and efficient sticker.

Brief reference is made to the progress of studies of the bionomics and control of the codling moth, grape leafhopper, curculio on apple and peach (by H. G. Butler and Dozier), and grape berry moth. In the Dover section the earliest curculio larvae were collected from dropped apricots on May 29, and a total of 572 larvae had matured and left 113 of the fruit by July 7. Two adults emerged on July 6 from the earliest of these grubs. From 324 peach drops collected at Camden on June 11, 690 larvae had left the fruit by July 13, while at Newark larvae collected on June 14 left the fruit and entered the soil to pupate on June 25. These data are considered to demonstrate the value of picking up and destroying early drops before the grubs mature and leave the fruit.

The grape berry moth has increased rapidly and spread over the State during the past few years. From a comparatively noneconomic insect it has during the last two years become of great importance in the grape-growing districts and caused great losses in some large commercial vineyards. The first eggs hatched on June 25, on which date newly entered berries were abundant in vineyards near Dover. At Newark infested grapes were first found on July 5.

In reporting upon the life history and control of the oriental peach moth (*Laspeyresia molesta*), it is pointed out that this pest occurs throughout the State and causes considerable loss to fruit growers by attacking both the peach and apple. At Woodside the earliest adults were noted in a packing house on May 7, 1928, and adults started to issue from overwintering material in pupation sticks at the Camden insectary on May 24. The adults obtained from the packing house deposited eggs as early as May 21. In Camden twigs were found infested with larvae on May 26, and adults emerged on June 20 from larvae from twigs collected in the field on June 5.

[Work with economic insects in Connecticut] (*Connecticut State Sta. Bul. 298 (1928), pp. 118–120, 125, 126, figs. 3*).—A brief report is first made on the spread of and control work with the Asiatic beetle (*Anomala orientalis*), the Japanese beetle, the European corn borer, and the gipsy moth, together with brief mention of the inspection of nurseries and the mosquito elimination work. Mention is then made of investigational work with the Asiatic beetle, the plum curculio, and the oriental peach moth.

In work with the plum curculio it was found that four applications of lead arsenate, preferably the pink, calyx, 7-day, and 2-week sprays, will give fair control. During the course of artificial control work with the oriental peach moth, the ichneumonid parasite *Glypta rufiscutellaris* was for the first time reared in the State in considerable numbers from this pest, it being more abundant than the other ichneumonid, *Macrocentrus ancylivora*, which hitherto had been its principal parasite.

Work done by the entomological department, R. A. Cooley et al. (*Montana Sta. Rpt. 1927, pp. 90–96*).—In grasshopper studies it was found that eggs which had never been subjected to low temperature developed most rapidly at 80° F. and more slowly at 90 and 100°. Thus, eggs laid in midsummer when soil temperatures are well above 90 and 100° are retarded, while eggs laid in the cooler fall months develop more rapidly, with the result that the development of all eggs as they enter winter is quite similar and all hatch within a period of a few days the following spring. It was found that if grasshopper eggs were held at low temperature (about 32°) for several months their rate of development was greatly accelerated when they were returned to temperatures at which they normally develop. Thus, eggs which required 46 days to hatch at 100° when placed at this temperature the day they were laid required only 10 days to hatch after they had been held at 32° for 240 days. It is pointed out that the effect of retardation of development at high temperatures in midsummer and the acceleration due to low temperatures in the spring is of distinct advantage to the species, since it confines the nymphal period to the spring season when green, succulent food is always available, at least during the early instars. As a result, practically all individuals mature at the beginning of the summer and a maximum period is allowed for oviposition.

In a study of the effect of low temperatures it was found that an exposure of 16 hours at 22° resulted in killing 100 per cent of the eggs, while the same exposure at higher temperatures did not cause any appreciable injury. In studying the effect of submergence in water it was found that there was a wide variation in the time necessary to kill grasshoppers, ranging from 3 hours at 100° to 84 hours at 32°.

In work conducted with mosquitoes with a view to their control, 37 species were found to occur in the State, with others to be added to the list. In experimental work it was found that eggs hatched the same season they were laid and new swarms of mosquitoes appeared after each irrigation of bluejoint meadows and alfalfa fields. It is pointed out that without irrigation there normally occurs but one generation, produced by the flood waters and rains of May and June, indicating that irrigation is one of the chief sources of the mosquito population.

Brief reference is made to a study of climatic relations of insects, particularly the weather conditions favorable for outbreaks of the pale western cutworm in the State, an account of which by Cook has been noted (E. S. R., 59, p. 760). The work has shown that when the total rainfall for May, June, and July is below 4 in. this species will increase in numbers the following spring, while if the rainfall is above 5 in. the insect will decrease.

Work with cutworms is under way, particular mention being made of the abnormal abundance of the dark-sided cutworm in 1926, of an outbreak of the army cutworm in 1926, and of an army cutworm outbreak near Hardin in 1927 which contained a fair percentage of *Feltia venerabilis arida*, a species not hitherto regarded as of economic importance. The rearing of cutworms under conditions of alternating temperatures showed that the alternations had a very stimulating effect upon the rate of growth. When worms were held for 2 hours per day at 27° C. and for 22 hours per day at a temperature too low for development, they went through a molt in 43 hours at the high temperature, but when held constantly at 27° it took 78 hours for the same growth. This is considered to show why cutworms can grow quite rapidly in early spring when there are only a few hours per day of warm weather.

In control work with the Mormon cricket, inaugurated during the season of 1927, inability to secure sodium arsenite led to the use of calcium arsenite, which, diluted at the rate of 1 lb. to 3 lbs. of lime, gave equally as good results with the additional advantage of saving 24 cts. per pound. The control work with this pest progressed rapidly. Hardly any crop damage occurred and the crickets were materially reduced. In the course of the work a new enemy of the Mormon cricket was discovered in the sphecid wasp (*Palmodes laeviventris* Cress.). The eggs of this wasp are laid and the larvae feed upon the paralyzed crickets, buried sometimes to the number of 5 or 6 in a single hole. Success with calcium arsenite dust against the Mormon cricket led to control work with the potato beetle, experiments showing that when this arsenical is mixed at the rate of 1 lb. with 8 lbs. of lime and applied at the rate of approximately 5 lbs. per acre practically 100 per cent control is obtained without injuring the plants.

[Report of the department of entomology of the Oregon Station] (*Oregon Sta. Bien. Rpt. 1925–26, pp. 96–107*).—In studies of casein spreaders in insect sprays, field tests in 1924 and 1925 showed no distinct advantage in codling moth control where they were used. Laboratory tests showed no advantage in preventing worm entrance where such spreaders were used.

Codling moth studies are reported upon, some of the more important life history records for 1924 and 1925 being summarized. It was observed that the moths laid no eggs until the twilight temperature on several consecutive evenings was 60° F. and above.

The Syneta fruit beetle (*Syneta albida* Lec.) continued to be prevalent throughout the Willamette Valley and to constitute one of the serious pests of the cherry. The beetle injures the stems and immature fruit of cherries so that the fruit either drops or becomes scarred so badly as to be unsalable as first or even second grade fruit. Insecticide tests indicate that a stronger than a standard lead arsenate solution (2 lbs. to 100 gal. of water) is necessary in order to control this pest, and that two applications should be made, one before blossoming and the second at the time the petals are dropping. A partial summary of the results of the spraying experiments at Salem for the Syneta fruit beetle on cherries in 1925 is included.

Insecticide work with the pear thrips, which is thought by some to be partly responsible for the fact that many prune orchards in Marion County have produced no good crops since 1918, is under way.

In minor fruit insect studies reference is made to control tests against the rosy apple aphid (*Aphis sorbi* Kalt.), San Jose scale spray tests, the cherry maggot survey, and the prune root borer (*Sanninoidea opalescens* Hy. Edw.). Nicotine sulfate at a dilution of 1 to 1,200 used against the rosy apple aphid was as effective as the stronger dilution of 1 to 800. Work with the prune root borer indicates that the spring use of paradichlorobenzene may be effective in the control of this borer. The results of two years' observations and one year's experiments indicate that it is not detrimental to trees under 6 years of age.

The small fruit insect investigations conducted include work with the strawberry root weevils (*Brachyrhinus ovatus* L. and *B. rugosostriatus* Goeze), the black vine weevil (*B. sulcatus* Fab.), and the black gooseberry borer (*Xylocrius agassizii* Lec.), an account of which by Chamberlin has been noted (E. S. R., 54, p. 557).

Brief reference is made to the gooseberry bud midge (*Rhopalomyia grossulariae* Felt) as a source of some injury; the strawberry leaf roller; and a new strawberry leaf roller (*Anacampsis fragariella* Busck), which appeared in 1925 for the first time in Oregon. It is pointed out that additional information is needed on the currant fruit fly and the strawberry crown moth (*Synanthedon rutilans* Hy. Edw.).

In control work with the onion maggot the use of Bordeaux oil emulsion gave the highest yield. The several minor vegetable insect studies include the beet leafhopper, the seed corn maggot (*Hylemyia* sp.), and the diamond-back moth. Brief reference is made to work on insect transmission of diseases. Control of the hop red spider (*Tetranychus telarius* L.) was obtained both in the laboratory and in the field by use of an insecticide consisting of lime sulfur (concentrated) 2 gal., dusting sulfur 5 lbs., calcium caseinate spreader 1 lb., and water 100 gal. A survey of the alfalfa weevil has shown it to occur in three counties. In a serious outbreak of cutworms that occurred throughout Oregon in 1925, several species were implicated, including the variegated cutworm, the olive green cutworm (*Neuria procincta* Grote), and *Prodenia perfecta* Grote. Lead arsenate was not as effective in the baits used as was sodium fluoride and white arsenic.

Notes are presented on observations of the lesser bulb fly, the narcissus bulb fly, and the bulb mite (*Rhizoglyphus hyacinthi* Boisd.) attacking bulbs in the State.

Control work with the symphilids (*Scutigerella immaculata* Newport), which destroyed vegetables in the Willamette Valley, was undertaken at the request of numerous truck and flower gardeners. This tiny centipede occurrs in such numbers that it destroys all sprouting seeds and in one commercial planting proved a serious pest of asparagus. Late in the biennium the pest was found in an aster plantation, causing losses estimated at more than $3,000. Grain soaked in bichloride of mercury solution proved to be of value in poisoning the pest.

In biological control work with the European earwig successful infestations by a tachinid fly (*Digonochaeta setipennis*) introduced from France and England was accomplished, but the use of a second introduced tachinid parasite (*Racodineura antiqua*) has not as yet been successful.

Reference is made to a preliminary study of the relative abundance of native bees and honeybees visiting the blossoms of the more common fruit trees.

An apparatus for use in the application of insecticides by airplane was devised and tested on an apple orchard at Monroe, Oreg., and in dusting alfalfa in eastern Oregon for the control of the alfalfa weevil. No difficulty was experienced in controlling the amount of dust discharged.

[Insect work at the Hood River Substation] (*Oregon Sta. Bien. Rpt. 1925–26, p. 120*).—A 4-year study of the comparative values of double strength and single strength arsenate of lead, 2 and 4 lbs. to 100 gal., with and without calcium caseinate as a spreader, as a control measure for the codling moth, was completed. Double strength lead arsenate was found to give consistently better control of the pest. The use of a spreader improves the finish of the fruit to a certain degree, in that no mottling of the skin occurs as a result of irregular coating of arsenate of lead, but does not increase the control of the pest.

Two year's work with the blister mite affecting apples, which has developed into a serious pest in many sections of the Northwest (E. S. R., 52, p. 759) have shown that full applications of lime-sulfur at the rate of 1 to 15 or stronger are effective. Lime-sulfur applied in the spring was more effective than oil sprays.

In tests conducted the oil barrier devised by British Columbia investigators as a means for controlling the strawberry root weevil proved ineffective under Hood River conditions.

[Insect control work at the Southern Oregon Substation] (*Oregon Sta. Bien. Rpt. 1925–26, p. 128*).—In control work with the codling moth at Talent, lead arsenate containing 1 per cent oil and spreader gave a somewhat better control than arsenate of lead and oil without the spreader. When the arsenate of lead and oil plus spreader was used less than 1 per cent of the fruit showed oil burning, while where the arsenate of lead and oil without spreader was used 3.5 per cent of the fruit showed spray burn.

In control work with the San Jose scale in 1924 entirely satisfactory results were obtained with both lime-sulfur and oil emulsions, but in 1925 the oil emulsions gave from 10 to 12 per cent better control of scale than did the lime-sulfur. The fact that lime-sulfur is more effective in some seasons than in others appears to be due to differences in weather conditions following the spraying.

[Studies of insect pests at the South Carolina Station] (*South Carolina Sta. Rpt. 1928, pp. 43–55, 73–76, figs. 6*).—Two important pests are recorded from the State for the first time, the oriental peach moth taken in Florence County, and a new cotton beetle (*Luperodes varicornis* Lec.), previously recorded from Georgia and North Carolina, collected in McCormick County where it damaged the blooms and squares.

Studies were made of the life history, habits, and importance of the corn billbug (*Sphenophorus maidis*), which is known to occur in six counties. The average number of eggs laid by this pest is 44 and the largest number by a single female 164. In control work calcium cyanide used at a strength which killed house flies in 3 seconds and June bugs in 2 minutes required 45 minutes to kill billbugs. The billbugs survived submergence in water for a period of 72 hours.

The cotton flea hopper, an account of which has been noted (E. S. R., 57, p. 163), was less abundant in 1928 than during the preceding year and much less so than in 1926. The highest infestations were found in Anderson County, where late injury was very severe.

Studies were made of a yellow thrips found to have been common on cotton during the period when seedling injury occurred, and reference is made to a second species much less commonly met with. The yellow thrips was found to develop in from 14 to 22 days, the incubation period having averaged from 5 to 6 days and the development of the immature form from 7 to 8 days. Control is obtained by the use of nicotine sprays and nicotine oil emulsion.

In work with the Mexican bean beetle 14.7 per cent of 4,000 beetles placed in hibernating cages in 1927 during the time they were migrating to hibernation quarters emerged and assumed normal activity during May and June, 1928.

Mention is made of the bean leaf beetle, one of the most important enemies of the bean in South Carolina, which may cause enormous damage to cowpeas, especially in dry years.

The giant root borer was present in several orchards of the State, having caused a loss of some 75 trees in one of the large orchards.

In control work an outstanding case of unexpected "burning" was experienced from magnesium arsenate, hitherto one of the safest arsenicals used on legumes in Mexican bean beetle control. Considerable burning was also experienced from lead arsenate used in the control of the plum curculio. The use of crêpe paper and corrugated paper bands treated with β-naphthol gave negative results in codling moth control due, it is thought, at least partly to excessive rains washing out the chemical. Mention is made of pyrethrum extracts as among the promising chemicals investigated during the year. The toxicity of calcium fluosilicate was increased without causing any burning to tender foliage.

Work with the tomato fruit worm indicated that more than half of the spoilage of tomatoes caused by the pest may be prevented by the application of poison either as a dust or a liquid spray. It was found that corn is much preferred, suggesting its usefulness as a trap crop for the protection of tomatoes. Reference is made to an attack of its eggs by *Trichogramma* sp.

A report is given of boll weevil studies at the Pee Dee Substation (pp. 73–76), including weevil hibernation, weevil activity in the field throughout the year, and poisoning. Of the 2,000 weevils placed in hibernation cages at successive intervals, (1) from September 23 to October 1, 12 survived; (2) from October 7 to 15, 36 survived; and (3) from October 15 to November 1, 35 survived. In another experiment in which 18,500 weevils were placed in hibernation 286 emerged alive, 88 appearing between March 1 and 31, 91 during April, 87 during May, and 20 between June 1 and 17. Of the total number of weevils placed in hibernation the percentage of emergence was 1.54.

In the study of weevil activity and weevil movement 65 farms in 10 different counties representing the various farming districts of the State were selected for weekly observation. The weevil emerged in abundance during May and early June and the population in the field decreased rather rapidly from the middle of June to about the middle of July, after which the weevil began to increase in the fields. From records kept on farms in Darlington County it was found that the weevil population was smaller in the areas where the stalks were destroyed, although the difference was not as great as might have been expected, due to the fact that stalks were not destroyed until the middle or latter part of October and possibly many weevils had gone into hibernation.

Poison tests were repeated, 2 applications of 1 : 1 : 1 calcium arsenate-molasses mixture being made on some plats and 4 applications on others. This treatment was compared with unpoisoned check plats and in some instances with plats dusted throughout the season with calcium arsenate dust. The results indicate that the application of poison early resulted in greater benefit for this season than has been the case heretofore.

Department of entomology, W. W. Baker (*Western Washington Sta. Bul. 10-W (1928), pp. 13-16*).—Reference is first made to work with the potato flea beetle, which has caused severe damage to tubers in Grays Harbor County during the past few years. The studies have shown that at least two species of flea beetle were present over most of the area, and that the relative abundance of the two varies with the season and locality. An examination of potatoes in Mason County indicated that plantings made before the middle of March were practically free from injury if dug for early potatoes. Potatoes from fields planted from July 1 to 12 in the same year were also largely free from tuber injury. Dusting with various combinations of lead arsenate, calcium arsenate, sodium fluoride, and sodium fluosilicate mixed with lime and sulfur and lime alone gave some protection to foliage, but in no case was a satisfactory degree of control for tubers obtained. A commercial product, an oleo-resin of pyrethrum, was used as a contact spray against the adults in 1927 with very satisfactory results at a dilution of 1: 150, but in 1928 a concentration of 1 : 100 did not kill the beetles. Nicotine dust was employed with excellent results, but the high cost prohibits its use except for checking the influx of the beetles at the edges of the potato fields early in the season.

The raspberry fruit worm, known locally as the loganberry worm, which attracted considerable attention as a pest of loganberries in 1927 and 1928, is briefly referred to. Since the adult feeds almost entirely inside the bud, with only a small portion of its abdomen outside, but slight control can be obtained by insecticides. Lead arsenate when applied after the blossoms had begun to open apparently gave fair control for the first portion of the crop, but the later pickings were as severely infested as were the unsprayed rows at the same time.

A report is given of a study of the life history, distribution, and control of the chicken tapeworm *Davainea proglottina*, for which the smaller garden slug, *Agrolimax agrestis*, acts as an intermediate host in Washington. Attempts to infest the slugs artificially by caging them on lawn grass which had the fresh intestinal contents of severely infested birds spread over it have so far failed.

A small buprestid, *Chrysobothris pubescens*, was reared from material received from White Salmon, Wash., where it was doing considerable damage to the crown of strawberries. This is said to be the first record of its attack upon the strawberry.

Halisidota argentata was studied principally as a pest of the Douglas fir, although it was taken on several other conifers. Two parasites, a braconid and a tachinid, were found in all colonies observed.

The fruit tree leaf roller in western New York, S. W. Harman (*New York State Sta. Bul. 561 (1928), pp. 31, figs. 6*).—This bulletin deals with the host plants, distribution, and life history of the fruit tree leaf roller, which became of economic importance in western New York apple orchards about 1911. Since that time it has appeared sporadically in certain areas and has caused considerable damage. The various forms of injury caused by the pest are described and methods of control outlined with special reference to western New York conditions.

The eggs are laid during June and July and hatch the following spring during the early pink stage of Greening apple blossom buds. The larvae produce the characteristic injury by feeding during a period of approximately one month on foliage, blossoms, and fruit, after which they pupate and emerge as moths during June and July. Egg laying completes the life cycle, there being but one generation a year.

Control is aimed at the destruction of egg masses by oil sprays and of newly hatched larvae by arsenicals. Oil emulsions containing 8 per cent actual oil when thoroughly applied at the time the buds are swelling and before any green tissue is showing will destroy the egg masses. If bud development is progressing rapidly and the question of safety must be considered, the oil content may be lowered to 6 per cent as the minimum. Weaker emulsions can not be expected to give results. Of the oil sprays used in these experiments the diamond paraffin oil emulsion was least injurious to the trees, cheapest, and also highly efficient in combating the leaf roller.

Because of the potential danger in oil sprays containing 6 and 8 per cent oil. the author emphasizes the fact that the chances of injury should not be increased by delaying the application until after green tissue is showing on the buds. Arsenate of lead should be used at the rate of 6 lbs. to 100 gal. to control the larvae, keeping the foliage well covered during the period when the caterpillars are most active.

The wheat jointworm in Oregon, T. R. CHAMBERLIN (*Oregon Sta. Circ. 86 (1928), pp. 7, figs. 2*).—This is a practical account of the wheat jointworm, which thorough surveys have shown to occur in two relatively small areas in the Willamette Valley in Oregon.

The foxglove aphid on potato and other plants, E. M. PATCH (*Maine Sta. Bul. 346 (1928), pp. 49–60, figs. 3*).—An account is given of *Myzus pseudosolani* Theob., its seasonal history, and food plants, followed by a host list representing 31 botanical families.

The author's study of this aphid was commenced in 1926, in May of which year it was found infesting potato seedlings in a greenhouse at Presque Isle, Me., experimental work being conducted during that year followed by observations by the author in 1927 in England. The species was described under the name *M. pseudosolani* by Theobald at Wye, England, in 1922, having been found by him on potatoes and especially abundant on the sprouts of seed potatoes. The author suggests the name foxglove aphid, since the common garden foxglove (*Digitalis purpurea L.*) has been found to be its primary food plant.

In Maine the aphid deposits its overwintering eggs on the foxglove, commencing late in September and extending through October. The eggs hatch in the spring and the aphids of the first generation, wingless forms called "stem mothers," seek shelter between the folded parts of the growing leaves. The stem mothers are slow in their development and are about a month in attaining full growth. The young are then produced viviparously. Most of the individuals of the second generation, being wingless, are also hidden between the leaves. The aphids of the third generation, in turn produced viviparously, are likely to feed exposed on the rapidly growing stalks of the foxgloves and, if abundant, the colonies are easily seen. With their last molt they become winged and, deserting the foxglove for the most part, fly to other plants more acceptable to the summer generations, the earliest migration occurring in June.

On the various food plants colonized by the summer aphids both wingless and winged females develop, the latter serving as dispersal forms as they leave the parent colonies for other plants. Late in the summer the winged females, known as fall migrants, are particularly attracted by the foxglove, and in

September and October, in Maine, the descendants of the fall migrants, comprising wingless males and oviparous females, are found there.

[Breeding and wintering bees] (*Wyoming Sta. Rpt. 1928, pp. 152, 153*).—In breeding work with bees Carniolans have proved satisfactory, and the experiments have shown the Caucasians to be superior to the Italians as regards wintering, honey production during adverse weather, temperament, and ability to rear brood rapidly in the spring. It is pointed out that the only apparent weakness of the Caucasians is that they build brace and burr combs excessively.

The two colonies on the university campus that wintered best were one that was entirely unprotected and one with only tar-paper packing and upward ventilation, notwithstanding the fact that the temperature in December went down to —20° F.

[Apiculture at the Alaska Matanuska Station] (*Alaska Stas. Rpt. 1927, pp. 23, 24*).—Two 3-lb. packages of bees and two 3-frame nuclei were received at the station in May from California and two full colonies from the northern part of Washington State, the two former being in better condition than the full colonies. The bees were active in the fields during nearly the whole of June and July and about half of August, but fireweed bloomed only for a short period and the drought caused many of the honey plants to cease blooming. As a result, the honey flow was poor, only one colony having sufficient honey to live through the winter. One of the full colonies swarmed August 5.

ANIMAL PRODUCTION

Preparing grain mixtures of specified protein content, A. E. PERKINS (*Ohio Sta. Bimo. Bul., 14 (1929), No. 1, pp. 12–17*).—The author describes various grain mixtures and gives in tabular form the amounts of various feeds to be used in combination for preparing grain mixtures of a desired crude protein content.

Commercial feeding stuffs, 1927–1928, J. M. BARTLETT (*Maine Sta. Off. Insp. 128 (1928), pp. 17–60*).—The usual report of the guaranteed and found analyses of feeding stuffs samples collected for official inspection for the year ended June 30, 1928 (E. S. R., 58, p. 267).

Comparison of conformation, anatomy, and skeletal structure of a highly specialized dairy cow and a highly specialized beef cow, W. W. SWETT, R. R. GRAVES, and F. W. MILLER (*Jour. Agr. Research [U. S.], 37 (1928), No. 12, pp. 685–717, figs. 18*).—Comparative measurements of the external conformation, skeleton, and internal organs were made by the Bureau of Dairy Industry of the high-producing Jersey cow Sophie 19th of Hood Farm and of the consistent show winner and regular-producing Aberdeen Angus cow, Blackbird of Dallas.

In external form considerable difference was found. The beef-type cow was higher at the pin bones, about the same height at the hips, and lower at the withers, in all about 98.8 per cent as tall as the dairy-type cow. Blackbird was shorter, deeper, and wider in body, and her body circumference, contour, and cross section were greater. Her body surface and barrel volume were calculated to be 20 and 70 per cent, respectively, greater. She was wider in proportion to depth at both fore chest and paunch, was more level over the rump, had heavier bone and a shorter, wider head, and a larger muzzle. Also she was about 87 per cent as leggy as Sophie. Of the measurements taken, only 5 were 25 per cent greater for Blackbird than for Sophie and in each case the difference could be attributed to heavy fleshing and to fat.

The weight and size of the internal organs were not significantly different in the two cows. The skeletal structure of the cows varied somewhat but were in general quite similar. The shape of the ribs, which in Blackbird had a greater arch, and the generally larger pelvic region in the dairy cow constituted the most important differences in these measurements.

The most marked difference, aside from external form, was in the udders of the cows. The udder of the beef-type cow was more compact and more closely attached with less looseness, greater width, and less depth. There appeared to be a greater quantity of tissue, which was more yielding and less coarsely and harshly fibrous than in that of the dairy-type cow. The milk veins on the udder and abdomen and the milk wells were inferior and the skin covering the udder thicker, mellower, and less flexible in the beef-type cow. Internally the udder of the dairy-type cow was made up almost entirely of gland tissue, while that of the beef-type cow had but a small quantity of gland tissue which was surrounded by a heavy layer of firm fat.

Feeding experiments [with cattle at the Matanuska Station, Alaska], H. W. ALBERTS (*Alaska Stas. Rpt. 1927, pp. 22, 23*).—A ration of 10 lbs. of oat straw, 5 lbs. of oat-vetch hay, 15 lbs. of oat-pea silage, and 8 lbs. of mangels, supplemented with a few hours' pasture daily from April 1 to 30, was fed to 3 groups of heifers for 120 days beginning January 1. The first group was composed of 3 Holstein-Friesians varying in age from 6 to 25 months, the second group of 4 Galloway-Holstein hybrids varying from 16 to 20 months of age, and the third group of 3 Shorthorns varying from 12 to 21 months of age. The average initial weights were 688, 786, and 856 lbs. per head, and the average total gains 63, 89, and —55 lbs. per head in the respective groups. The Shorthorns finished in the best condition, having been fat at the start of the test.

The above ration was reduced one-half on May 1, on May 16 further reduced to a limited nightly feed, and discontinued altogether on June 1. During this phase of the test, the cattle were on pasture for a 91-day period beginning April 1. The Holstein group gained an average of 140 lbs. per head, the hybrid group 161 lbs. per head, and the Shorthorn group 112 lbs. per head.

In these trials the hybrid cattle proved to be the hardiest, and the Shorthorns the least hardy. Part of this difference may be explained by the fact that the Shorthorns had been closely housed, while the other breeds had been selected for hardiness and rustling ability. For the feed fed the Holsteins and hybrids made satisfactory gains, while the Shorthorns did not pay for the feed consumed. The test brings out the fact that only hardy, thrifty animals may be profitably kept in this region.

[Experiments with beef cattle at the Montana Station] (*Montana Sta. Rpt. 1927, pp. 47, 48, 54, 55, 57, 58, 60, 79, fig. 1*).—The results of several experiments are noted.

Full feeding grain to yearling steers most profitable, H. W. Vaughan, W. E. Joseph, and L. Vinke.—A full feed of alfalfa hay was given to 4 lots of yearling steers of 10 head each for a period of 152 days. In addition a grain mixture of 3 parts of barley and 1 part of oats was given in amounts varying in the different lots from a full feed to one-half of a full feed. Another lot received alfalfa hay alone. The average daily gains in the lots receiving the full grain ration, the one-half grain ration, and the no grain ration were 1.97, 1.7, and 1.15 lbs. per head, respectively. The selling prices per hundredweight of these lots were $10.50, $9.25, and $9, respectively. The grain-fed steers were fat enough for slaughter cattle, but the steers fed hay alone had to be sold as feeders.

Wintering beef cows, G. Morgan and E. Sandberg.—In two trials at the Northern Montana Substation, dry pregnant cows in fair condition maintained their weight for 100 days on a ration of 1 lb. of cottonseed cake and all the straw they would eat. Two trials indicated that 429 lbs. of cottonseed cake were necessary to replace 1 ton of alfalfa hay in a ration of alfalfa, silage, and straw or alfalfa and straw for wintering cows. It required 333 lbs. of cottonseed cake to replace 1 ton of corn fodder in a winter ration of corn fodder and straw.

Winter feeding of yearlings, G. Morgan and E. Sandberg.—In this study it required 479 lbs. of cottonseed cake fed with straw to replace 1 ton of alfalfa hay in a ration for wintering yearling cattle. The ration in which cottonseed cake was used produced larger gains but was not as economical as the ration of alfalfa hay and straw.

Feeding beef calves, G. Morgan and E. Sandberg.—Continuing this study (E. S. R., 55, p. 563) it was found that when silage was omitted from the ration there was but slight advantage for alfalfa over bluejoint hay for calves. Five years' results comparing the effect of winter gains on subsequent summer gains showed that the higher the winter gain the lower the summer gain but the greater the total gain.

A ration of alfalfa hay and a grain mixture of 3 parts of barley and 1 part of oats was fed for 171 days to a lot of 13 choice steer calves and a lot of 14 common steer calves. The first lot made slightly larger gains, required less feed per unit of gain, and were valued at $2 more per hundredweight on the market than the common calves.

Fattening yearling and two-year-old steers, J. R. Quesenberry, A. L. Baker, E. B. Krantz, and R. E. Hutton.—A lot of 10 yearling steers at the U. S. Range Livestock Experiment Station full-fed barley and alfalfa hay for 140 days gained at the rate of 1.95 lbs. per head daily as compared with a daily gain of 1.77 lbs. per head for a similar lot of 2-year-old steers. It required 153 lbs. less grain and 182 lbs. less hay per 100 lbs. of gain for the yearlings. However, due to the fact that the 2-year-olds were valued at 40 cts. per hundredweight higher on the market, they returned a greater profit. A similar lot of 2-year-olds fed half as much grain gained approximately 0.5 lb. less per head daily, sold at a lower price, and returned less profit than the full-fed steers. Adding 1 lb. of cottonseed cake per head daily to the ration of a lot of yearling steers lowered the daily gain, increased the cost of gain, and decreased the profit per head.

Method of feeding affects quality and palatability of beef, J. E. Richardson and E. Jacobs.—Roasts cooked from beef fattened with either full feed of barley and alfalfa hay or with 50 per cent as much barley with alfalfa hay were fine in texture, tender, juicy, rich, and had a desirable flavor and aroma. Roasts from beef fattened on alfalfa hay alone were coarse, tough, dry, lacking in richness, and somewhat undesirable in flavor and aroma.

[Experiments with beef cattle at the Eastern Oregon Substation] (*Oregon Sta. Bien. Rpt. 1925–26, pp. 129, 130*).—The results of two experiments are noted.

Growing and fattening beef steers.—It was found that steer calves and yearlings carried through the winter on maintenance or submaintenance rations made greater gains on grass during the grazing season than similar animals wintered on fattening rations.

Growing beef heifers.—Heifer calves were divided into 10 lots of 10 head each, 2 of which were placed on each of the following rations: (1) Straw and 4 lbs. of alfalfa hay, (2) alfalfa hay (half fed), (3) alfalfa hay and silage (medium fed), (4) alfalfa hay (full fed), and (5) alfalfa hay and 3 lbs. of rolled barley. The heifers in the odd lots were bred to calve as 2-year-olds and the others as 3-year-olds. There was a difference of 273 lbs. in the weight of the 2-year-olds grazed during the summer and fed for 2 winters on ration 5 over those receiving ration 1. The average birth weight of calves from heifers fed ration 5 was 68 lbs. and from heifers fed ration 1 62 lbs.

Steer feeding (*South Carolina Sta. Rpt. 1928, p. 36*).—Purebred steers fed a ration of shelled corn, cottonseed meal, and corn silage made an average daily gain of 2.59 lbs. per head as compared with 1.89 lbs. for scrub native steers. The cost of 100 lbs. of gain was slightly in favor of the scrub steers, but the better finish and higher selling price of the purebred steers made them more profitable.

[Experiments with beef cattle at the Wyoming Station] (*Wyoming Sta. Rpt. 1928, pp. 142, 143, 164*).—The results of two experiments are noted.

Subsequent effects of different methods of wintering beef calves.—The comparison of rations for wintering calves which constitutes the first part of this study has been completed. On a ration of unlimited alfalfa hay and about 2 lbs. of barley per day the calves made an average daily gain of 1.16 lbs. per head, on unlimited native hay and 2 lbs. of barley 0.91 lb. per head, and on unlimited native hay and about 1 lb. of cottonseed cake 1.06 lbs. per head. The ration of native hay and barley was the most efficient in cheapness of ration and in cost per pound of gain, and alfalfa hay and barley the most expensive. The cost of the various ingredients in the ration should be the determining factor in deciding which feeds to use.

[*Steer feeding at the Worland Substation*].—A ration of wet beet pulp, alfalfa hay, and either corn or cottonseed cake proved the most satisfactory feed in a 100-day feeding test with 7 lots of steers.

[Experiments with sheep at the Montana Station] (*Montana Sta. Rpt. 1927, pp. 49–52, 60, 61, 79, figs. 2*).—Several experiments are briefly noted.

Hay substitutes for wintering range ewes, H. W. Vaughan, W. E. Joseph, and L. Vinke.—In a study of the use of various feeds as partial substitutes for alfalfa hay in the winter ration of ewes, it was found that 1 lb. of cottonseed cake replaced over 2.6 lbs. of hay, 1 lb. of yellow corn replaced somewhat less than 2.5 lbs. of hay, 1 lb. of oats replaced approximately 2.3 lbs. of hay, and that about 3 lbs. of sunflower silage were equal to 1 lb. of hay.

Hampshire vs. Rambouillet sires, H. W. Vaughan, W. E. Joseph, and L. Vinke.—The results of a 4-year study have shown that lambs sired by Hampshire rams weighed more at 5 months of age than those sired by Rambouillet rams. Especially is this true when good grazing is provided.

Slow improvement by culling on fleece weights, H. W. Vaughan, W. E. Joseph, and L. Vinke.—Continuing this work (E. S. R., 56, p. 164), results have shown that culling on the basis of live weight is 70 per cent more effective for increasing the average weight of wool and lambs than culling on the basis of fleece weights only. Culling 6 per cent of the ewes on the basis of both live and fleece weights did as much to improve the production of wool and lambs as culling 19 per cent of the ewes on a fleece-weight basis alone.

Length of staple in relation to weight of fleece, H. W. Vaughan, W. E. Joseph, and L. Vinke.—It was found that while a relationship may exist between changes in length of staple and changes in fleece weights, the former does not wholly account for changes in the latter. Shrinkage variations were probably important factors in weight changes of fleece from year to year.

Wheat screenings may cause objectionable flavor in lamb, H. W. Vaughan, W. E. Joseph, and L. Vinke.—Lambs fed wheat screenings containing 28.1 per cent of wheat, 16.1 per cent of fanweed, 20.7 per cent of hare's-ear mustard, and lesser amounts of other weed seeds developed a weed-seed flavor in the meat after 60 days on feed. Feeding on screenings for 68 days and then on wheat for 60 days almost eliminated the objectionable flavor. When the lambs were fed wheat for 82 days after 128 days on screenings, the flavor was reduced to an almost negligible point.

Shall we add silage to a screenings-alfalfa ration for fattening lambs? J. R. Quesenberry, A. L. Baker, E. B. Krantz, and R. E. Hutton.—Over a period of 3 years at the U. S. Range Livestock Experiment Station, 296 lambs were fed a ration of alfalfa hay and screenings, while 301 lambs were fed corn silage, alfalfa hay, and screenings. The lambs averaged 67 lbs. in weight when started on feed, and the feeding periods ranged from 89 to 103 days. All the lambs gained on the average between 21 and 22 lbs., but 35 per cent of the lambs fed no silage were sold as feeders, while only 22 per cent of those fed silage were sold in this manner. The silage-fed lambs commanded a slightly higher price and returned a higher price for each ton of hay fed.

Wheat v. wheat screenings for feeding lambs, J. E. Richardson and E. Jacobs.—The meat produced when wheat was used for fattening had a desirable aroma and flavor when roasted but was slightly tough and of a loose fibrous texture. The results with lambs fed wheat screenings are referred to above.

[Experiments with sheep and goats in Oregon] (*Oregon Sta. Bien. Rpt. 1925–26, pp. 37, 38, 130*).—The results of experiments are briefly noted, several of which are in continuation of those previously reported (E. S. R., 55, p. 665).

Breeding efficiency of ewes.—Results in this study indicate that high condition in breeding ewes seldom causes low breeding efficiency, but is often the result of barrenness. The vigor of the ram, management of the flock at breeding time, and the general health of the ewes are believed to influence to a marked degree the breeding efficiency of the flock.

Pasture yields for farm sheep.—Native sod pastures have yielded for several years from 200 to 300 sheep days per acre, depending upon the season. Rye grass pasture during a 2-year period yielded 400 to 500 sheep days per acre. Native sod proved to be the cheapest source of pasture, but was not satisfactory as a summer pasture for lambs. Pasturing Hungarian vetch in the spring postponed the cutting of the hay crop, improved the quality of the hay, and reduced the yield if the pasture was grazed beyond the first of May or was overstocked.

Winter rations for ewes.—In studies at the Eastern Oregon Substation, alfalfa hay has proved to be a most satisfactory winter feed for ewes. Silage has been fed as a supplement to the hay before lambing without any harmful effects. Alfalfa hay proved superior to mixed hay fed with or without grain supplement. However, when 0.5 lb. of barley was fed with mixed hay during the winter season good results were obtained.

Fattening lambs.—Corn proved to be the most fattening of several small grains in tests with fattening lambs at the Eastern Oregon Substation. A ration of alfalfa meal, molasses, and barley produced the most rapid gains, but from the standpoint of economy and availability of feeds alfalfa hay and barley was the most satisfactory ration for this section of the State.

Land clearing with goats.—This study has shown that in order to kill brush, the goats must be closely confined and the brush overgrazed to such an extent that other feed is necessary for the animals. Goats ate practically all of the green growth of deciduous shrubbery and conifers native to the Willamette Valley, but showed the least preference for poison oak and Scotch broom. One year's browsing killed all the conifers. Slashing the brush after browsing was found to be the most satisfactory method of clearing land, since under this system no growth less than 5 ft. in height had to be slashed.

[Experiments with lambs at the Wyoming Station] (*Wyoming Sta. Rpt. 1928, pp. 160, 163*).—Three experiments are noted.

[*Lamb feeding at the Eden Substation*].—Native lambs fed a ration of mixed barley and oats and alfalfa hay gained at the rate of 0.338 lb. per head daily. Similar lambs fed barley and alfalfa hay made practically the same gain, and the cost of feed was about the same in both lots.

[*Lamb feeding at the Torrington Substation*].—Lambs fed beet pulp and alfalfa hay gained at the rate of 0.17 lb. per head daily in comparison with a gain of 0.28 lb. per head when a concentrate such as corn or cottonseed cake was added to the pulp and hay.

[*Lamb feeding at the Worland Substation*].—The results obtained at this station with pulp and hay duplicate those found at Torrington. Substituting bean straw for alfalfa hay resulted in very poor gains.

Protein supplements for growing fattening pigs, A. E. TOMHAVE (*Delaware Sta. Bul. 158 (1928), pp. 13*).—Continuing this study (E. S. R., 58, p. 464), 4 lots of 10 spring pigs each averaging approximately 68.5 lbs. per head were fed for 76 days. Lots 1, 3, and 4 were fed on rape pasture and lot 2 on alfalfa pasture. Shelled corn was fed to all lots, and in addition lots 1 and 2 received ground soy beans, lot 3 ground soy beans and tankage, and lot 4 cracked soy beans. The average daily gains in the respective lots were 1.17, 1.32, 1.11, and 0.86 lbs. per head. In economy of feed required per unit of gain and in cost of gains, the lots ranked as follows: 1, 2, 3, and 4.

Self-feeding ground soy beans in dry lot to 3 lots of 10 pigs each for a period of 105 days in combination with shelled corn and alfalfa leaf meal or tankage and minerals gave very poor results.

[Experiments with swine at the Montana Station] (*Montana Sta. Rpt. 1927, pp. 52–54, 58, 59, 61, 62, 63, 64*).—Several experiments are briefly noted.

High value of alfalfa pasture for pigs, H. W. Vaughan, W. E. Joseph, and L. Vinke.—A mixture of 96 per cent of barley and 4 per cent of tankage fed to pigs averaging 36.5 lbs. on alfalfa pasture produced a gain of 1.06 lbs. per head daily, while when fed to similar pigs in dry lot it produced only 0.81 lb. of gain per head daily. Pigs on pasture required 4.43 lbs. and those in dry lot 4.95 lbs. of feed per pound of gain. The alfalfa pasture saved 676 lbs. of barley and 26 lbs. of tankage per acre.

A low-cost method of making pork, H. W. Vaughan, W. E. Joseph, and L. Vinke.—Feeding 1.5 lbs. of barley and 2 oz. of tankage per head daily on alfalfa pasture and finishing in dry lot on a ration of 96 per cent of barley and 4 per cent of tankage proved to be a more economical method of finishing spring pigs than full feeding or feeding no concentrates on pasture. Only about 3 lbs. of concentrates were required per pound of gain with this method.

A new meat meal or tankage for hog feeding, H. W. Vaughan, W. E. Joseph, and L. Vinke.—Vitamont, a tankage manufactured from the wild range horses of Montana, was compared with standard tankage in 2 trials. Two lots of pigs averaging 56 lbs. were carried to a final weight of 195 lbs. on a ration of hulled barley, alfalfa hay, and 5 per cent of either tankage or Vitamont. The two tankages were practically equal in feeding value. When fed free choice along with barley and alfalfa, pigs ate about 7 per cent of the Vitamont, made very satisfactory gains, and showed that the product was quite palatable. In a total of 5 different trials Vitamont was a little better than tankage in 3, but the differences were so small that the feeds may be considered to be of equal value.

Peas prove effective as supplement for fall pigs, H. W. Vaughan, W. E. Joseph, and L. Vinke.—Peas added to a barley-alfalfa hay ration for fattening pigs produced slower gains than when tankage was added, but the pea-fed lot required less feed to produce a unit of gain.

Peas more efficient than barley for fattening hogs, H. W. Vaughan, W. E. Joseph, and L. Vinke.—When peas replaced half or all of the barley in a fattening ration of barley, tankage, and alfalfa, the peas were 32 per cent more effective than barley in the amount of feed required to produce a unit of gain. On the other hand, the barley ration produced the most rapid gains.

[*Experiments with hogs at the Northern Montana Substation*], G. Morgan and E. Sandberg.—In these studies pigs weighing 80 to 100 lbs. were used for hogging down flint corn for 3 successive years when the yields were 20, 4.6, and 18.7 bu. per acre. Each year 4 lots of 10 head each were fed with and without protein supplements in the field. The average net return per acre of corn when no supplement was fed was $8.06, when alfalfa hay was fed $9.52, with tankage $10 53, and with alfalfa hay and tankage $11.25.

Adding tankage to a ration of rye and alfalfa hay at the rate of 5.5 lbs. of tankage for each 100 lbs. of rye increased the rate of gain, but decreased the economy of gain. The average results of 2 trials showed that 100 lbs. of tankage replaced 47 lbs. of grain and 150 lbs. of alfalfa hay in a barley-rye-alfalfa hay ration for fattening pigs. Durum wheat in 2 trials proved to be superior to rye, both in rate and economy of gains, when fed in combination with alfalfa hay or tankage and alfalfa hay for fattening pigs.

[*Experiments with hogs at the U. S. Range Livestock Experiment Station*], J. R. Quesenberry, A. L. Baker, E. B. Krantz, and R. E. Hutton.—A comparison of the economy of sows and gilts for raising market pigs showed that 27 sows weaned 182 pigs from 18 litters, while 26 gilts weaned 140 pigs from 20 litters. The total weight at weaning time of the pigs from the sows was 4,956 lbs. and from the gilts 4,837 lbs. From December 1 to weaning time, the sows gained 789 lbs. and the gilts 2,089 lbs. The sows consumed 379 lbs. more grain and 1,796 lbs. more hay, but ate 32 lbs. less tankage and 45 lbs. less minerals than the gilts. After crediting the gain of the sows, the feed cost of the weaned pigs per hundredweight was $12.19 and the cost of the pigs from the gilts was $10.17.

For 2 consecutive years 80 pigs fed approximately 1.5 lbs. of corn on irrigated alfalfa pasture made more rapid gains than 79 similar pigs fed barley. Corn proved to be 10.3 per cent more effective under these conditions than barley.

These lots were each divided into 2 equal groups, and 1 group from each lot was full fed corn and tankage in dry lot, while the other groups were full fed barley and tankage. In 2 trials the 40 pigs fed barley on pasture and finished on corn and tankage made 8.6 per cent greater gains in dry lot than pigs fed corn on pasture. The 40 pigs fed corn on pasture made 6.1 per cent greater gains on corn and tankage in dry lot than those finished on barley and tankage. The corn and tankage ration was only 3.4 per cent more efficient than barley and tankage when the pasture treatment was the same with limited barley. This study shows that feeder pigs developed on a limited ration of barley on alfalfa pasture respond more readily to corn feeding in dry lot than similar pigs on corn.

Pasturing hogs on dry-land crops, D. Hansen, A. E. Seamans, and T. Moseley.—Pasture tests at the Huntley Substation have shown that greater gains are produced on alfalfa than on brome-grass pasture. Little difference was noted in the gains on broadcost alfalfa or alfalfa sown in rows. Field peas have been found to be more palatable than winter rye, but the latter has the greater carrying capacity and is available for use earlier in the spring. During the dry part of the summer, Sudan grass, soy beans, and sorgo have furnished palatable and satisfactory pasturage. Hogging down corn has been more profitable than husking and feeding, especially when the crop is large.

[Experiments with swine at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1925–26, p. 37*).—A study of the value of protein feeds for supplementing barley showed that mill-run was not very satisfactory, that a mixture of middlings and tankage was superior to tankage alone, and that a mixture of alfalfa leaves and tankage, while giving fair results, was not equal to tankage alone or to middlings and tankage. It required three times as much horse beans as tankage to balance a barley ration. However, horse beans were an economical source of protein since they could be grown on the farm.

Comparing rye and barley, each supplemented with 6 per cent of tankage for fattening pigs, showed that the gains on rye were 31 per cent less and the cost 4 per cent more than those on the barley ration. In addition the rye was quite unpalatable.

It was found that an acre of rape pasture replaced approximately 1,200 lbs. of grain in the ration of fattening pigs, and that pigs self-fed on such pasture gained faster than those self-fed in dry lot. Rape pasture supplemented with 2 lbs. of grain per 100 lbs. of live weight produced satisfactory growth for young pigs.

In two tests to determine the best method of preparing barley for growing and fattening pigs, the feeds ranked as follows: Steam-rolled barley, finely ground barley, coarsely ground barley, whole soaked barley, and whole dry barley. The last two feeds did not prove satisfactory, and since steam-rolled barley is not produced on the farm, finely ground barley is most advisable.

Cull apples fed at the rate of 3 lbs. to 1 lb. of grain produced gains of 1.4 lbs. per pig daily. It required from 400 to 900 lbs. of apples to replace 100 lbs. of grain.

[Feeding experiments with swine at the South Carolina Station] (*South Carolina Sta. Rpt. 1928, p. 35*).—Brief results of experiments are given in continuation of those previously noted (E. S. R., 58, p. 668).

Protein supplements for fattening hogs.—Pigs receiving a combination of fish meal and peanut meal made an average daily gain of 1.75 lbs. per head at a cost of 7.5 cts. per pound of gain, while those on a combination of fish meal and soy bean meal gained at the rate of 1.59 lbs. per head daily at a cost of 8 cts. per pound of gain.

At the Pee Dee Substation pigs fed corn and soy beans grown in the corn gained at the rate of 1.34 lbs. per head daily, while pigs hogging down corn with tankage as a protein supplement made an average daily gain of 1.87 lbs. per head. The cost of 100 lbs. of gain was $4.34 and $6.03 in the respective lots. Slow and expensive gains were made by pigs hogging down corn and beans grown in adjacent lots.

Grains rations for hogs on soy bean forage.—Pigs receiving a full feed of corn and tankage made more rapid gains while grazing soy beans than those fed corn alone or a limited feed of corn and tankage. At the end of the grazing period the pigs were finished on mature soy beans. The corn and tankage ration produced the fastest gains for the entire test, and the limited corn and tankage ration the cheapest gains. An acre of green soy beans had an average feed-saving value of $39.28, while an acre of mature beans saved only $22.85 worth of feed.

[Experiments with hogs at the Wyoming Station] (*Wyoming Sta. Rpt. 1928, pp. 144, 145, 162, 163*).—Three experiments are briefly noted.

Wyoming grains for hogs.—A comparison of Wyoming-grown corn and barley for feeding hogs showed that from March 20 to June 30 the average daily gain on corn was 0.812 lb. and on barley 0.802 lb. per head. An examination of the meat of hogs killed from each lot showed no apparent differences in quality.

The average daily gains for three breeds of hogs, half of which received the corn ration and the other half the barley ration, were Hampshires 0.864, Spotted Poland Chinas 0.841, and Berkshires 0.716 lb. per head.

[*Hog feeding at the Sheridan Substation*].—Two years' results with local feeds have shown that hull-less barley produced the most economical gains and rye the most expensive gains when fed to pigs. Adding tankage to a hull barley ration increased the rate and decreased the cost of gains.

[*Hog feeding at the Torrington Substation*].—Hogs self-fed free choice hulled barley and corn made an average daily gain of 2.11 lbs. per head, and the same gain was obtained when corn was fed during the second half of the feeding period. Ground rye produced a daily gain of only 1.68 lbs. per head.

Draft horses at steady work furnish power at lowest cost, J. R. Quesenberry, A. L. Baker, E. B. Krantz, and R. E. Hutton (*Montana Sta. Rpt. 1927, pp. 62, 63*).—Records of the feed consumption and amount of work done by draft horses under Montana ranch conditions were kept at the Miles City Substation. Ten horses, each of which worked an average of 418.5 days during a 2-year period, averaged 175.9 days on the range at 3 cts. per day and 554.1 days on feed. Another lot of 10 horses worked an average of 159.6 days each and averaged 388.8 days on the range and 341.2 days on feed. The average feed cost per hour of work was 6 cts. in the first lot and 10 cts. in the second lot.

Utilization of ground soybeans for poultry, A. E. Tomhave and C. W. Mumford (*Delaware Sta. Bul. 158 (1928), p. 15*).—Baby chicks were divided into 3 pens of 272 chicks each on April 8 and fed the same basal ration for 21 weeks (E. S. R., 58, p. 467). The following supplements were fed with the basal ration: Pen 1 25 lbs. meat scraps, 10 lbs. dried buttermilk, and 3 lbs. bone meal; pen 2 58 lbs. ground soy beans, 10 lbs. dried buttermilk, and 10 lbs. bone meal; and pen 3 66 lbs. ground soy beans and 10.5 lbs. bone meal. The nutritive ratio and percentage of ash were practically the same in all rations. The mash required per pound of gain was 5.63, 6.65, and 6.42 lbs. in the respective lots. In the lots fed ground soy beans the chicks did not get a good start, but growth was fairly satisfactory after the tenth week.

Laying pullets receiving ground soy beans did not produce as many eggs as lots receiving meat scraps and dried buttermilk as supplements to the basal ration.

Add cooked potatoes to chickens' ration (*Ohio Sta. Bimo. Bul., 14 (1929), No. 1, p. 25*).—In this article the feeding of boiled or steamed potatoes, mixed while hot with enough mash to make a moist, crumbly mixture and fed at the rate of from 6 to 10 lbs. daily for each 100 hens, is advocated as a means of maintaining body weight, keeping up egg production, and adding variety to the ration during the winter months.

Breeding to extend the profitable age of the domestic fowl (*Oregon Sta. Bien. Rpt. 1925–26, p. 47*).—Rigid culling standards have made the strains of Barred Plymouth Rocks and White Leghorns used in this study more uniform in appearance and have increased the percentage of Barred Rock pullets laying standard eggs (22 oz. per dozen) by about 12 per cent per generation for four generations. The weight of the Leghorn eggs was not increased greatly, but was sufficiently high in the first generation so that little culling was necessary on this point alone.

[Experiments with poultry at the Western Washington Station], Mr. and Mrs. G. R. Shoup (*Western Washington Sta. Bul. 10–W (1928), pp. 24–40*).—Results of several experiments are noted.

Keeping straw litter dry by forced circulation of heated air, G. R. Shoup and L. J. Smith.—A laying house 130 ft. long and 16 ft. wide was divided in half. One side was forced-ventilated and the other side ventilated by means of roof ventilators and roller curtains at the front (E. S. R., 59, p. 379). Air heated to 78 to 82° F. was forced by means of a blower through a flue attached to the underside of the dropping boards in the forced-ventilated side Records were kept of the time of operation, fuel used, inside and outside temperatures, costs and income from 240 pullets of comparable laying ability on each side of the house.

Each bird on the forced-ventilated side received a little over 50 cu. ft. of air per hour, more than is ordinarily recommended. It was found that 1° increase in heat decreased the moisture content of the air about 4 per cent. These birds came through the winter in a little better physical condition than those on the other side of the house as indicated by their heavier lay in April when ventilation was discontinued. However, the increased cost of forced ventilation made the birds in this lot return $12.40 less profit one year and $42.88 less the second year than the birds in the lots not forced-ventilated. However, as some means of preventing freezing combs, wattles, milk, water, and litter and droppings seems advisable, the experiments will be continued.

Green feed trials on pullets, 1926–27.—The above pens were also used to obtain information on the green feed requirements of laying pullets, to compare dry powdered skim milk with liquid skim milk, and to test the value of an all-mash ration (E. S. R., 56, p. 868) for a small flock under coast conditions. Two lots fed on green feed had the highest mortality, but gave fairly satisfactory financial returns. This indicates that green feed can be discontinued during the months when succulent feeds are not available. Dry powdered skim milk produced the best results, and mortality in this lot and the lot receiving liquid skim milk was very low. The all-mash ration proved quite satisfactory for small flocks, especially where skim milk was available. Alfalfa hay as a sole source of green feed gave satisfactory results.

Age of pullets in 1927–28 green feed trials.—Of the eggs laid by 258 February-hatched pullets during 10 months, 78.5 per cent were standard eggs, 21 per cent pullet eggs, and 0.5 per cent peewee eggs; by 83 April-hatched birds 64.1 per cent standard, 33.9 per cent pullet, and 2 per cent peewee; and by 141 May-hatched birds 57.2 per cent standard, 39.7 per cent pullet, and 3.1 per cent peewee.

Feeding trial.—White Leghorn pullets were divided into two groups of 438 birds each. One lot received an all-grain mash with sour skim milk as the only source of animal protein, while the other lot received mixed grains, mash, milk, and water. It was found difficult to get the birds to consume enough of the mash and milk ration to keep production high during the peak price of eggs. Also there was no control over feed consumption. Other difficulties experienced with this ration were lowered production during the fall and winter months, unsatisfactory dampness of litter, and the extra labor involved in cleaning pans and providing the milk. The advantages of the system lay in the fact that the feeds were mixed at the mill, hoppers were filled once a week, and mortality was low.

In conjunction with this experiment tests were made of various beddings. Oat straw proved to be the poorest bedding, followed by oat hulls. Peat was a good but rather expensive bedding, and it was found necessary to rake it off frequently to prevent hardening. Much labor was required to remove it in the spring, since it adhered rather closely to the floor.

The influence of feeding on fertility and hatchability of Single Comb White Leghorns.—Six lots of Leghorns in their second, third, or fourth year's lay were divided so that each lot contained from 80 to 86 birds and were fed to determine the influence of green feed, cod-liver oil with or without milk, and semisolid buttermilk. The hens were mated to cockerels out of 250-egg or better dams. In the pen receiving a green feed the fertility, 89.1 per cent, was highest and was lowest in the lot receiving semisolid buttermilk, 77.5 per cent. In the other lots fertility ranged from 85.9 to 87.8 per cent. The pen receiving cod-liver oil and milk had a hatchability of 55.8 per cent, and the check lot, which received no additions to the basal ration, a hatchability of 47.7 per cent. Mortality was highest in the pen receiving cod-liver oil, milk, and greens and lowest in the check lot. However, the total mortality of all pens was less than 10 per cent. The feed cost was lowest in the check lot and highest in the lot receiving cod-liver oil alone.

[Experiments with poultry at the Wyoming Station] (*Wyoming Sta. Rpt. 1928, pp. 146–148, 163*).—The results of experiments in continuation of those previously noted (E. S. R., 59, p. 263) are reported.

Hatching eggs in an incubator at high altitudes.—The same basal ration was fed to 3 lots of hens, and in addition lot 1 received 5 per cent of alfalfa leaf meal as green feed, lot 2 a like amount of cabbage, and lot 3 sunflower silage. The hatchability of the eggs in lot 1 was 10 per cent higher than in lot 2 and 22 per cent higher than in lot 3. That hatchability may be due to differences in incubators was shown by the fact that there was a difference of 11 per cent between the highest and lowest incubators as measured by the number of eggs set.

Crooked breastbones of turkeys.—Based on 3 years' results it has been definitely established that crooked breastbones are due to deficient rations, and that when bone-forming elements and direct sunlight are not present during early life the deformity can not be corrected at a later date even by feeding the most perfect ration.

Turkeys fed a ration containing 35 per cent of animal protein and bone meal weighed 16 lbs. at 5 months of age, as compared with a weight of 11.6 lbs. when receiving only 20 per cent of animal protein and what green feed they could gather themselves, and a weight of 12.8 lbs. on a ration of 20 per cent of protein and an abundance of green feed. Of the 56 birds on the high-protein feed, none developed crooked breastbones.

Green feed and direct sunlight for chickens.—Milk from a cow not exposed to direct sunlight for 40 days previous to and during the 7 weeks of the experiment showed no deficiencies in vitamin content when fed to chickens.

Chicks reared in pens containing 18 sq. ft. of space under Cel-O-Glass or in direct sunlight grew normally and weighed 1.375 lbs. each at the end of 3 weeks. A similar pen on unlimited alfalfa range weighed 1.625 lbs. at the same age.

[*Poultry experiments at the Torrington Substation*].—Hens fed rations containing 20 per cent of protein produced more eggs than those in which the protein constituted only 5 per cent of the ration. Hens in an insulated house did not show a significant increase in egg production over those in a house not insulated. Due probably to the more even temperature in the insulated house, molting was less marked with these hens. Electric lights during the winter months increased egg production over and above the cost of the lights.

Recommendations to beginners in fur farming, F. G. Ashbrook (*U. S. Dept. Agr. Leaflet 27 (1928), pp. II+6*).—General suggestions to persons contemplating entering the fur-farming business, together with specific information concerning the various fur-bearing animals and notes as to where further information may be obtained, are included in this leaflet.

DAIRY FARMING—DAIRYING

Improvement of the station dairy herd, A. E. Tomhave (*Delaware Sta. Bul. 158 (1928), p. 14*).—A study of the records of 14 daughters of 1 Holstein bull used at the station showed the average 10 months' records of the daughters were 16.37 per cent higher in milk production, 28.66 per cent higher in butterfat production, and 10.59 per cent higher in butterfat percentage than the dams. Eleven of the daughters exceeded their dams in milk production, and all exceeded their dams in some respect. When the dam's milk record exceeded 8,000 lbs. of milk in 10 months, none of the daughters equaled this record, but in 50 per cent of the cases when the average test of the dams was 3.49 per cent of butterfat the daughters excelled this record.

Feeding the dairy cow, H. W. VAUGHAN, W. E. JOSEPH, and L. VINKE (*Montana Sta. Rpt. 1927, p. 49*).—Continuing this study (E. S. R., 56, p. 169), 4 years' results have shown that oat and pea silage and sunflower silage have about the same feeding value. The former is more palatable, but leaves an objectionable odor in the barns. It is also somewhat laxative, while the sunflower silage has a constipating action.

[Experiments with dairy cattle at the Oregon Station] (*Oregon Sta. Bien. Rpt. 1925–26, pp. 41–43, 45, 46, 109*).—The results of several experiments are noted.

Metabolism studies.—Preliminary results indicate that cheat hay alone is not a satisfactory roughage for growing heifers. Biting the boards of the stalls in which the animals were confined and poor growth were indications of the deficiencies of this feed.

Studies with alfalfa hay.—In a comparison of central Oregon and Willamette Valley alfalfa hay, 2 lots of 4 cows each were fed for 342 days. Three cows of each lot received hay alone, while the fourth cow received corn silage in addition. While there was little difference in the two hays, it required a little less of the central Oregon hay to maintain body weight and to produce more butterfat. The cows fed hay alone consumed on the average 30.54 lbs. per day and produced an average of 3,952.9 lbs. of milk and 147.63 lbs. of butterfat during the test. The cows receiving silage ate about 30 lbs. of hay and 20 lbs. of silage per day and produced an average of 5.452.1 lbs. of milk and 185.56 lbs. of butterfat during their lactation period. When chopped hay was fed instead of long hay there was an increase in consumption of feed, less waste, and a higher milk and butterfat production.

Studies on the feeding of succulents.—In studies on feeding of succulents, using the double reversal method, 2 lots of 6 cows each were fed through three 28-day experimental periods with 7-day transition periods to compare kale and corn silage as sources of succulence. The total production while kale formed part of the ration was 8,234.8 lbs. of milk and 357.12 lbs. of butterfat, while when corn silage was fed 7,876.1 lbs. of milk and 338.21 lbs. of butterfat were produced. The lot receiving corn silage during the first period was fed about one-half as much succulents throughout the test as the other lot, and the data indicate clearly that from the standpoint of economy the production in this lot was the cheapest.

Official testing.—A study of the records of the Official Test showed that 1-day and 2-day tests checked to within approximately 1 lb. of each other, and it is considered from this that the 1-day test is just as effective and reliable as the 2-day test. A check of the milk actually reported and the milk estimated from the Official Tests showed that in 77.4 per cent of the cases reported the milk was within 3 per cent and in 89.6 per cent of the cases within 5 per cent of the estimated milk. In checking the records to determine whether a preliminary milking was an essential precaution to Official Test work, it was found that when the preliminary milking was used the average production was 515.3 lbs. of fat and when preliminary milking was not used there was an average fat production of 515.83 lbs.

[*Studies at the Astor Substation*].—Records show that the production of the spring freshening cows dropped 45 per cent from June 1 to September 15. The feeding of green crops during this period reduced the decrease to 30 per cent.

A ration of 8 lbs. of hay, 40 lbs. of roots, 25 lbs. of silage, and 5 lbs. of grain per 1,000 lbs. of live weight for cows producing 1 lb. of butterfat per day was found to be the best ration from the standpoint of economy, production, and palatability in studies at this station.

Experiments with dairy cattle (*South Carolina Sta. Rpt. 1928, pp. 38–43, figs. 3*).—The results of several experiments in continuation of those previously reported (E. S. R., 58, p. 671) are briefly noted.

The utilization of sorghum grains in silage.—A 10-day trial with 2 cows receiving a ration of finely ground yellow corn meal, cottonseed meal, and sorghum silage showed that 28.28 and 26.3 per cent of the seed in the silage was voided in the feces by the respective animals.

The value of grinding hay for dairy cattle.—Ground and unground oats and vetch hay was fed to 2 groups of 5 cows each for a period of 120 days. In addition to the hay the ration consisted of corn silage and a grain mixture. During the test 10.79 per cent of the unground and 4.14 per cent of the ground hay were refused by the animals. There was no significant difference in the production of milk or butterfat in the 2 groups. The amount of silage required to produce 100 lbs. of milk was practically the same, while approximately 4 lbs. more grain and 8 lbs. less hay was required when unground hay was fed.

The digestibility of ground and unground oats and vetch hay.—A digestion trial of 15 days' duration with 4 dry mature cows showed little difference in the digestibility of ground and unground oats and vetch hay. With the exception of the ether extract, grinding had a slightly depressing effect upon the digestibility of the nutrients of the ground hay.

Slaughter work.—In cooperation with the U. S. D. A. Bureau of Dairy Industry, 7 complete ante-mortem and post-mortem records have been made of cows with a known production record. A Holstein heifer with a record of 410.94 lbs. of butterfat had a total length of both large and small intestines of 182.41 ft., while another heifer with a record of 439.9 lbs. of butterfat had a total length of 159.45 ft. A mature Guernsey cow with a record of 633.1 lbs. of butterfat had a total intestinal length of 210.47 ft.

[Experiments with dairy cattle at the Wyoming Station] (*Wyoming Sta. Rpt. 1928, p. 145*).—Two experiments are noted.

Feeding dairy calves.—In this study (E. S. R., 59, p. 267), 14 Holstein heifers have been fed to 12 months of age. At 6 months of age they averaged 371 lbs. per head, 6.3 per cent above the Eckles' standard (E. S. R., 50, p. 577), and at 12 months 658 lbs., 18 per cent above the Eckles' standard. Cutting the milk ration 4 lbs. a day, with grain replacing the milk, and then discontinuing the milk after 90 days had no harmful effects upon growth. Heifers fed alfalfa hay and grain on good pasture grew well even on a restricted milk diet.

Feeding Holstein heifers after they are 12 months old.—Feeding alfalfa hay alone to heifers from the twelfth to the eighteenth month of age produced good growth. Adding about 2 lbs. of barley to the hay ration further increased the rate of growth. However, the skeletal growth was practically the same in both groups. The heifers receiving barley were simply in better flesh.

Chemical sterilization of dairy utensils, M. J. Prucha (*Illinois Sta. Circ. 332 [1929]. pp. 11, figs. 6*).—Concluding this study (E. S. R., 60, p. 263), it was found that chlorine solutions are suitable sterilizers for dairy utensils. A solution containing 50 to 100 parts of active chlorine per 1,000,000 parts of water is recommended for use in rinsing or in pumping through large equipment, a strength of 70 to 100 parts of active chlorine per 1,000,000 parts of water for dipping, and a strength of 200 parts of chlorine per 1,000,000 parts of water for spraying. Water at a temperature of not over 120° F. is advised for use with the chlorine solutions. The sterilizing solution should be applied just before the utensils are used and should be in contact with all surfaces for at least 10 seconds in order to kill the bacteria. The solutions are only effective on surfaces that are free from dirt and grease.

The solutions should not be used for treating milk, as they impart off flavors and are not effective for delaying growth of bacteria in the milk. After the first use some of the available chlorine is lost, so that it is recommended that solutions be not used a second time. A compound with a guaranteed chlorine content and one that will hold its strength should be selected for this work.

Thermophilic and thermoduric microorganisms with special reference to species isolated from milk.—V, Description of spore-forming types, P. S. PRICKETT (*New York State Sta. Tech. Bul. 147* (*1928*), *pp. 58*).—Continuing this study (E. S. R., 58, p. 771), an attempt was made to determine the species of heat-loving spore formers that are at least partially responsible for the "pin point" colonies found on agar plates prepared from pasteurized milk. Of the cultures of spore formers studied 10 types were recognized, 8 of which have been previously described. These types are as follows: *Bacillus subtilis*, *B. terminalis thermophilus* n. var., *B. michaelisii* n. comb., *B. calidus*, *B. thermoalimentophilus*, *B. aerothermophilus*, *B. thermoliquefaciens*, *B. nondiastaticus*, *B. calidolactis*, and *B. kaustophilus* n. sp. These groups are characterized by being aerobic, by having terminally located ellipsoidal to cylindrical spores, and by their thermal relations.

All but two of the types were isolated from sources outside of the milk plant, and from this it is believed that heat-loving and possibly heat-resistant organisms originate outside the milk plant and gain entrance through the raw milk. It was found that the flora of some raw milk was made up so largely of thermoduric and thermophilic types that pasteurization caused only a comparatively small reduction in the number of the organisms present. The growth of heat-loving organisms in pasteurized milk produces undesirable changes in the product, but there is no evidence that they have any particular importance from the standpoint of public health.

Heat-resistant and heat-loving bacteria in their relation to the pasteurization of milk, R. S. BREED (*New York State Sta. Bul. 559* (*1928*), *pp. 19, figs. 6*).—A review of recent studies at the station, most of which have been previously noted (E. S. R., 58, pp. 770, 771; 59, p. 269; 60, p. 473) or noted above.

Studies on the proteolytic bacteria of milk, I–III, W. C. FRAZIER and P. RUPP (*Jour. Bact., 16* (*1928*), *Nos. 1, pp. 57–78, pls. 2; 3, pp. 187–196*).—Three studies are noted.

I. *A medium for the direct isolation of caseolytic milk bacteria* (pp. 57–63).—In this article, the first of a series by the U. S. D. A. Bureau of Dairy Industry, a casein agar is described which is used as a medium for direct isolation of caseolytic milk bacteria.

II. *Action of proteolytic bacteria of milk on milk* (pp. 67–78).—In this study 229 cultures were isolated from as many sources as possible, being limited to aerobic or facultative, mesophilic organisms found in milk. The action of the organisms was studied by measuring the increase in the omino nitrogen, by roughly estimating the ammonia, and by testing to identify indol, indol acetic acid, and tryptophane in both autoclaved and steamed milk held for 10 days at 30° C.

It was found that the cocci were mostly acido-proteolytic and produced only small increases in amino nitrogen in the milk. The Gram-negative rods varied from weakly to actively proteolytic, while the Gram-positive spore-forming rods divided themselves into three groups (1) high acid, low amino-nitrogen group; (2) low acid, low amino-nitrogen group; and (3) low acid, high amino-nitrogen group. The bromine test for free tryptophane was helpful in identifying the organisms which break down casein. This test was usually more satisfactory in autoclaved milk, since milk so treated favors the action of the more actively proteolytic organisms than in steamed milk. However, autoclaved milk had no advantage over steamed milk for the weakly proteolytic organisms.

III. *Action of proteolytic bacteria of milk on casein and gelatin* (pp. 187–196).—The action of the above cultures on casein and gelatin was studied, and it was found that the organisms could be subdivided into a number of groups based on their action on gelatin media. Of the cocci four caused no increase in amino nitrogen in casein or gelatin media, and the same was true of four of the rods. With the exception of *Micrococcus ocreus*, the bromine test was positive in all cases of caseolysis.

M. varians apparently could not split sodium caseinate and could split calcium caseinate, and some of the other organisms seemed to split calcium caseinate easier than sodium caseinate. The amount of caseolysis by most organisms was not markedly affected by increasing the amount of fermentable sugar in the media up to 0.1 per cent, but with *M. percitreus* the caseolysis apparently decreased with increasing amounts of sugar. Caseolysis by the acid-forming *Streptococcus liquefaciens* was apparently aided by the increase in sugars.

The effect of surface tension upon the growth of the lactobacilli, W. R. Albus (*Jour. Bact., 16 (1928), No. 3, pp. 197–202*).—In this study by the U. S. D. A. Bureau of Dairy Industry the effect of surface tension on 58 strains of lactobacilli is presented in an endeavor to show cultural variations of certain members of the genus that may be of value in the differentiation of the members of this group.

The inhibiting effect of Streptococcus lactis on Lactobacillus bulgaricus, L. A. Rogers (*Jour. Bact., 16 (1928), No. 5, pp. 321–325*).—A number of experiments were conducted by the U. S. D. A. Bureau of Dairy Industry in which sterile milk was inoculated with *S. lactis*, which was allowed to develop and then inoculated with *L. bulgaricus*. A check flask was inoculated with *L. bulgaricus* alone and both flasks held at 37° C. They were frequently neutralized to maintain a reaction of approximately pH 6.

There was practically no multiplication of *L. bulgaricus* in the flask with the lactic culture, while in the check flask it grew rapidly. Heating to boiling did not destroy its inhibiting effect, but filtering through earthenware or plaster of Paris filters partially removed it. Further studies showed that dead lactic cells did not have any inhibiting effect upon the growth of *bulgaricus*. The author believes that the lactic culture produces a specific substance which when diffused in sufficient quantities through the collodion membrane inhibits the growth of *bulgaricus*.

VETERINARY MEDICINE

Studies of animal diseases, H. Welch and E. Jungherr (*Montana Sta. Rpt. 1927, pp. 64–66*).—Brief reference is made to studies of sheep parasites and of blackleg in sheep. It was found that in both cattle and sheep strains of the blackleg organism there was a great variation in their virulence for sheep. The most reliable agent in immunizing against blackleg in sheep was a strain of the organism that had become avirulent in the laboratory.

In work with lamb diseases, infectious dysentery of very young lambs was encountered which was caused by *Bacillus welchii*, apparently transmitted by the mother's milk. This disease caused heavy losses, and the preparation of an antiserum for use in combating it was under way.

The disease commonly known as "stiff lambs" was found to comprise two or three diseases with similar symptoms. One of these was traceable to infection of the navel cord at birth, readily controlled by a rigid disinfection of the cord, and the other to coccidiosis.

In control work with goiter the feeding of an iodized salt mixture carrying a 0.02 per cent potassium iodide to sheep and cattle in goiterous districts was found to be sufficient to prevent the disease. In this work about 25,000 ewes were fed such a salt mixture during the winter of 1926–27, no goitered lambs appearing. The salt was prepared by mixing 1 oz. of potassium iodide with 300 lbs. of stock salt.

In work with white diarrhea of chickens the application of the agglutination test was commenced in 1926 when 1,000 hens were tested, and was continued in 1927, in which year 10,000 were tested. The favorable results obtained in hatchability and liveability of the eggs from tested flocks are said to have stimulated further testing.

A new disease of turkeys came to attention in which the crop, gullet, and stomach are extensively invaded by a fungus growth which practically destroys the mucous lining of the digestive tract and causes the emaciation and finally the death of the bird. Efforts to cultivate the fungus and produce the disease were unsuccessful.

[Report of the department of veterinary medicine of the Oregon Station] (*Oregon Sta. Bien. Rpt. 1925–26, pp. 48–52*).—The progress of work with infectious abortion is first reported upon, the results indicating that reinfection is probably an important factor in second or third abortions. Studies of the economic losses indicate an average decrease in production following infection of from 20 to 25 per cent. As regards age, the records of 43 cows show that the younger the animal at the time of infection the more serious the results of the disease. The work of establishing abortion-free herds from abortion-infected herds was continued and very satisfactory progress made. On the Hermiston project the percentage of reactors in all animals tested decreased from 43 per cent in 1922, when the first test was conducted, to 11 per cent in 1926. In the 9 herds which had been tested continuously the percentage decreased from 51 to 9 per cent.

Field studies in Tillamook County with more than 80 bulls showed that approximately 33.3 per cent of them were either sterile or fertile only a part of the time.

In work with coccidiosis of poultry it was found that a 2 per cent solution of potassium bichromate prevents putrefaction and at the same time does not interfere with either sporulation or longevity of oocysts. Sporulated oocysts kept moist with such a solution maintain their virulence for considerable periods, while those exposed to putrefactive processes lose their virulence rather rapidly. As regards the length of time following infection that birds will void oocysts in their droppings, 30 to 40 days were found to be the limit. A very definite immunity was produced through the administration of gradually increased amounts of the infection. Inoculation experiments demonstrated that birds raised on range under commercial flock conditions and management frequently acquire an immunity against coccidiosis. It is considered probable that this immunity is the result of continuous exposure to small amounts of the infection.

As regards the relation of lameness and paralysis to coccidiosis, inoculation experiments with lame and paralyzed birds resulted in typical acute cases of coccidiosis, indicating that the paralysis was not the result of chronic coccidiosis.

Feeding experiments with embryonated eggs of the cecal worm (*Heterakis papillosa*) resulted in the production of mature forms in 30 days.

Studies of salmon poisoning in dogs, found to be due to a minute intestinal fluke (*Nanophyes salmincola*), work relating to which has been noted (E. S. R., 55, p. 373; 57, p. 877), is briefly summarized.

Miscellaneous studies referred to include that of icterohemoglobinuria in cattle, approximately 67 per cent of the affected steers treated with the antiserum obtained from the Nevada Experiment Station recovering; pernicious anemia in horses diagnosed in animals in Wasco County; stomach worms in sheep and goats, due to a species of stomach worm not previously recorded from Oregon; and *Taenia krabbei* in deer taken from deer killed in Douglas County.

Report of the parasitologist (*Porto Rico Sta. Rpt. 1927, pp. 27–31*).—A report of G. Dikmans on work commenced in 1924 and extending through to June 8, 1926, is first presented, followed by a report of H. L. Van Volkenberg on work in 1927.

The first part of the first report (pp. 27, 28) lists the various nematodes, trematodes, and cestodes taken in the examination of domestic animals during the period 1924 to 1926. This is followed by a record of the external parasites found attacking domestic animals in Porto Rico during the period. The author records the finding of *Syngamus laryngeus* in the goat. While this nematode has been previously reported as occurring in cattle on the island, it is thought to be the first record of its parasitism of goats. The fluke *Posthormostomum commutatum*, recorded as a parasite of the chicken, turkey, guinea fowl, and pigeon in Italy and Tunis, is recorded for the first time from the United States. *Platynosomum fastosum*, a common parasite of the cat in Brazil, is reported for the first time from this country.

In the first part of the second report (pp. 28–31) parasites collected during 1927 hitherto unrecorded from Porto Rico are listed. In a general survey conducted, in which most of the material was obtained from the abattoir at Mayaguez, some 100 sets of viscera of cattle, goats, and hogs were systematically examined with a view to determining the species of parasites, the percentage infested, and the importance of the parasites collected. The study so far indicates that the most serious parasites attacking cattle, arranged tentatively according to their economic importance, are stomach worms, Texas fever ticks, liver flukes, nodular worms, longworms, mange mites, coccidia, flies, and lice. The seriousness of stomach worms and also nodular worms is said to have forced cattle raisers in certain localities to keep their animals in board-floored pens elevated above the ground, occasionally cement-floored pens, and to feed them by hand until they were several months old. An unidentified filarial worm, attached to the cervical ligament, though apparently of no pathogenic importance, was found in over 80 per cent of the cattle examined.

Very little is said to be known regarding the seriousness of parasites affecting goats, although stomach worms were found in about 75 per cent of those examined, nodular worms in over 70 per cent, and whipworms in about 30 per cent. Lungworms and liver flukes were found to be common. *S. laryngeus* is much more common in goats than in cattle.

A study of the life history of the kidney worm, *Stephanurus dentatus*, of swine indicated that infestation is direct and that the larvae undergo a stage of development in the liver of the pig before passing to the fat surrounding the liver and kidneys. A systematic examination of intestines from over 100 pigs disclosed the hookworm, *Necator suillus*, in only 2 instances.

[Report of the department of veterinary science of the Western Washington Station] (*Western Washington Sta. Bul. 10–W (1928), pp. 43–51, figs. 3*).—In experimental work with chicken pox by C. E. Sawyer a vaccine consisting of pulverized chicken pox scab (3 to 6 months old) 1 gm., physiological saline solution plus 0.5 per cent phenol 50 cc., and glycerine 50 cc. was applied with a swab to feather follicles with considerable success. A similar vaccine applied the same way to 4,000 Single Comb White Leghorn pullets that were averaging 60 per cent egg production led to a reduction to about 20 per cent for a period of 3 weeks and a mortality of more than 5 per cent, with a return to normal at the end of the period. The work has shown that chickens can be immunized against subsequent inoculation with chicken pox virus, that it lasts at least 2 years, and probably during the life of the birds. Over 2,000 Single Comb White Leghorn pullets and cockerels which were vaccinated by this method when between 3 and 4 months of age were protected against subsequent natural infection with chicken pox during fall and winter months. There were apparently no bad results from the vaccination except a loss of appetite for a few days during the third week following.

Brief reference is made to work by Sawyer with coccidiosis in which chicks taken from incubators and reared in cages were inoculated with sporulated oocysts and later treated with various drugs in an attempt to control the disease, with negative results.

The comparative value of four methods employed in conducting the routine agglutination test for bacillary white diarrhea by Sawyer and C. M. Hamilton is considered.

In work with the chicken tapeworm *Davainea proglottina*, by Sawyer and Hamilton, garden slugs infested with the cysticercoids were fed in gelatin capsules to cage-raised pullets. The birds to which infested slugs had been fed were killed 15, 21, and 25 days after feeding, and numerous tapeworms were demonstrated in the intestine of each, one having 243. In an experiment in which 10 cage-raised birds were fed one slug each, the results indicated that slugs did not become infested within 19 days after they were fed.

In abortion control work, by J. W. Kalkus and Sawyer, the method employed, previously noted (E. S. R., 59, p. 76), consisting in the application of the agglutination test periodically and segregating the positive and negative cows into two groups on the basis of the test, continued to meet with success in the station herd. A brief report is made upon further results obtained from the intravenous injection of dyes for the purpose of destroying the abortion organisms in the udder.

Work with red water in cattle, reported upon by Kalkus and Sawyer, is briefly referred to (E. S. R., 59, p. 76). In the experiments one heifer was fed a total of 20,910 gm. of oxalic acid in 852 doses from April 10, 1924, to August 16, 1926, without giving any indication of the disease. Two other animals remained in good physical condition during the feeding experiment after having received 31,970 and 28,780 gm., respectively, within periods of some 40 and 34 months, respectively.

[Report of the veterinary department of Wyoming Station] (*Wyoming Sta. Rpt. 1928, p. 155*).—In work with necrobacillosis, or diphtheria of calves, C. Elder succeeded in cultivating the causative organism on horse-serum agar. It was noted that an extremely small percentage of chicken pox has been found in Wyoming poultry. In vaccination studies, work has been conducted with autogenous bacterins and some commercial products, the results indicating that vaccination is of little or no importance in preventing this disease of poultry.

[Report of zoology department of Wyoming Station] (*Wyoming Sta. Rpt. 1928, pp. 158, 159*).—It is again (E. S. R., 56, p. 574; 59, p. 272) pointed out that under certain conditions infestations of the broad tapeworm of sheep (*Moniezia expansa*) can be produced at will. During the year J. W. Scott obtained 100 per cent infestation with *M. expansa* in lambs kept in a lot with a pond in it. Only negative results were obtained during the year in work with the fringed tapeworm (*Thysanosoma actinioides*).

A study made by Scott and V. Whittier is thought to have cleared up an important and disputed point in the life history of *Sarcocystis muris*, indicating that there is no differentiation into male and female cells. It is believed this will help in the solution of the life history of *S. tenella*.

Poisonous plants (*Wyoming Sta. Rpt. 1928, pp. 148, 149*).—Reference is first made to work under way with several poisonous plants, including the silvery lupine (*Lupinus argenteus*), a second lupine (*L. leucophyllus*), plains larkspur (*Delphinium geyeri*), plains death camas (*Zygadenus gramineus*), and arrow grass (*Triglochin maretima*). In studying the effect of cutting the plains death camas, it was found that no second growth had occurred at the end of six weeks, indicating that some of the worst patches can be controlled by cutting and grubbing.

Hemorrhagic septicemia in sheep, cattle, and hogs (*Oregon Sta. Bien. Rpt. 1925–26, pp. 78, 79*).—A brief account of this disease as it occurs in Oregon. While not serious in cattle or hogs, it is increasingly severe in sheep, 10,000 doses of vaccine being sent out each year.

The pathology and bacteriology of the reproductive organs of mares in relation to sterility, W. W. Dimock and P. R. Edwards (*Kentucky Sta. Bul. 286 (1928), pp. 155–237, figs. 2*).—An extended account of investigations conducted, the details of which are presented in large part in tabular form.

The authors find that the method of making a bacteriological examination of the cervix and uterus of barren mares as here outlined is, when properly carried out, a most reliable method of determining the presence or absence of infection in the uterus of mares.

"Approximately one-third of all barren mares examined were found to be suffering with either a severe or mild form of cervicitis and metritis due to infection. Approximately two-thirds showed no clinical evidence of cervicitis and metritis and were negative on bacteriological examination. Most noninfected mares are consistently negative on culture; most infected barren mares are consistently positive on culture. Most mares suffering from uterine infection will fail to conceive when bred.

"Streptococci are the most common form of infection found as a cause of cervicitis and metritis in mares. *Streptococcus genitalium* lives as a saprophyte in the external genitals of mares. It is found just inside the lips of the vulva of maiden mares and of mares in foal. Of forty mares foaling normally, one-half showed streptococci in uterine secretions when examined from one to nine days after foaling.

"All cases of metritis from which encapsulated bacilli were isolated were classed as encapsulatus infection, even though other bacteria, including streptococci, were present. On the basis of field and experimental data, encapsulated bacilli causing metritis in mares may be transmitted from mare to mare by the stallion at time of service, the greatest danger being the first few days after serving an infected mare. Stallions do not become permanent carriers of the infection. Metritis of mares due to encapsulated bacilli is differentiated from metritis due to other causes by the character of the exudate and the isolation of the bacillus. In cases of metritis in mares due to infection with streptococci and to encapsulated bacilli, the principal distinguishing feature, in both the clinical and gross pathology, is the character of the exudate. Microscopic sections of uteri from cases of metritis due to streptococci and to encapsulated bacilli show no differential characters of diagnostic value. Mares showing clinical evidence of cervicitis and metritis should, if negative on culture, be reexamined; also mares showing no clinical evidence of infection should, if positive on culture, be reexamined.

"The streptococcus found in cases of infection of the genital tract of mares, and which has been designated as *S. genitalium*, is a Gram-positive, hemolytic streptococcus. It possesses the fermentative characters generally attributed to the *S. pyogenes* group. It has been found uniformly virulent for rabbits and nonpathogenic for guinea pigs. The encapsulated bacilli which have been isolated from cases of genital infection in mares have been found to be identical in their morphological, biochemical, and serological properties. They have been compared with encapsulated bacilli from human sources, and have been found to belong to the group of organisms designated by Julianelle as type B of the Friedlander bacilli. It is noteworthy that most of the strains of the other types have been found in infections in humans. Barren mares, free from infection of the genital tract, are more resistant to infection at time of service than are foaling mares. The prevention of streptococcic and other forms of infection in the genital tract of mares is fundamentally a question of sanitation and breeding hygiene."

Agglutination and pathological studies in bacillary white diarrhea: Confirmation of the macroscopic agglutination test for bacillary white diarrhea by gross pathological lesions of the disease as determined by post mortem examination of carrier birds, R. S DEARSTYNE, B. F. KAUPP, and H. S. WILFONG (*North Carolina Sta. Tech. Bul. 34 (1928), pp. 27, figs. 8*).—In this report of investigations the details are given, largely in tabular form, of the gross lesions found at autopsy in birds reacting to the agglutination test. The birds had reacted to tests made by the State Department of Agriculture with a commercial antigen and by the station with a highly sensitized one developed from strains of *Salmonella pullorum* isolated from chicks.

In the testing work there was a difference of but 5 per cent in the results obtained by the State and the station workers. During the two years, 759 hens, 459 pullets, and 21 cocks and cockerels reacting to the test were examined, and the post-mortem findings are here reported upon in detail. Of these reactors 91.8 per cent of the hens, 61.9 per cent of the pullets, and 33.33 per cent of the cocks and cockerels showed gross pathological lesions of the disease. The organism was isolated at the station from 69.3 per cent of 678 hens showing lesions, from 55.2 per cent of 292 pullets with lesions, and from 33.33 per cent of 21 males and confirmed by carbohydrate reaction and agglutination against a known positive serum. The organism was recovered once from the heart and twice from the testes of the cocks and cockerels.

There is shown to be a marked difference in the agglutinability of strains of *S. pullorum* isolated from various sources. In the strains secured from chicks dying of the disease the property of agglutinability was present to a greater degree than in those strains secured from infected chicks dead in the shell on the twenty-first day, from infected eggs, and from lesions in the adult carrier bird. Strains developed for antigenic purposes should be selected relatively according to these groupings.

The data obtained indicate that there is a tendency toward a greater concentration of antibodies as the birds mature and as the infection becomes more pronounced. There is no correlation between serum titer and the recovery of the causative organism nor definite relation between serum titer and pathological lesions.

The study of the transmission of the disease through infected eggs and pathological lesions produced by the disease in chicks indicates that the longer period of incubation tends to develop the percentage of egg infection to a much greater degree of accuracy than when fresh eggs are used. The organism was recovered from 5.9 per cent of 829 fresh eggs examined that had been laid by infected pullets. A total of 710 eggs were examined in order to determine the effect of the longer period of incubation on infection. Of 113 infertile eggs 13 were positive for *S. pullorum*, of 119 dead on the seventh day of incubation 15 were infected, as were 35 of 272 dead on the fourteenth day, and 66 of 206 dead in the shell on the twenty-first day. The percentage of infection for all was 18.2.

An examination of the abdominal and thoracic viscera of chicks found dead in the shell from this disease on the twenty-first day has shown gross pathological lesions similar to those of chicks which die of the same disease during the first week of their lives under the hover.

The account concludes with a report of the microscopic pathology of seven chicks dead in the shell on the twenty-first day and of six brooder chicks dying of the disease during the first ten days of their lives. These two classes showed a general parallel in the gross pathological lesions and bacterial and microscopic pathological findings.

Rabbit parasites and diseases, B. Schwartz and W. B. Shook (*U. S. Dept. Agr., Farmers' Bul. 1568 (1928), pp. II+30, figs. 23*).—In the first part of this publication rabbit parasites and their control are dealt with by Schwartz (pp. 2–24). This is followed by an account of bacterial and other diseases by Shook (pp. 25–30).

AGRICULTURAL ENGINEERING

Engineering methods applicable to agriculture, L. W. Wallace (*Mech. Engin. [New York], 51 (1929), No. 3, Sect. 1, pp. 193–196*).—A brief exposition of the industrial problems of agriculture is presented in support of the contention by the American Engineering Council that a thorough engineering analysis of the agricultural industries will point the way to a fundamental and an economic improvement in agriculture. A suggested outline of study in this connection is presented.

[Conclusions from work in agricultural engineering at the Montana Station], H. E. Murdock, R. M. Merrill, and V. D. Young (*Montana Sta. Rpt. 1927, pp. 66–70, figs. 3*).—Data are reported from experiments on the cultivation of listed corn, the use of the furrow drill and the combine, and on duty of water in Montana. In work on the measurement of hay in stacks the results showed that the actual cross section of a haystack is greater than that obtained by using the rule provided by the State law.

Surface water supply of the United States, 1924, VIII, IX (*U. S. Geol. Survey, Water-Supply Papers 588 (1928), pp. VI+229, fig. 1; 589 (1928), pp. V+159, fig. 1*).—The first of these reports, prepared in cooperation with the State of Texas, presents the results of measurements of flow made on streams in the western Gulf of Mexico drainage basins during the year ended September 30, 1924. The second report, prepared in cooperation with the States of Colorado, Wyoming, Utah, and Arizona, presents the results of measurements of flow made on streams in the Colorado River basin during the same period.

Use of water on Federal irrigation projects, E. B. DEBLER (*Amer. Soc. Civ. Engin. Proc., 55 (1929), No. 3, pt. 1, pp. 751–783, fig. 1*).—A large amount of tabular data from the results of field measurements of water delivered to farms on Federal irrigation projects is presented.

Duty-of-water investigations (*Oregon Sta. Bien. Rpt. 1925–26, pp. 72, 73*).—Data are reported which indicate that approximately 5 in. per acre of water is needed to make a ton of alfalfa, 4 in. for 100 bu. of potatoes, and 0.5 in. for a ton of beets.

Federal legislation and regulations relating to the improvement of Federal-aid roads and national-forest roads and trails (*U. S. Dept. Agr., Misc. Circ. 109 (1928), pp. [2]+36*).—The texts of the legislation and regulations are given.

Public Roads, [January, 1929] (*U. S. Dept. Agr., Public Roads, 9 (1929), No. 11, pp. 209–224+[2], figs. 26*).—This number of this periodical contains the status of Federal-aid road construction as of December 31, 1928, together with the following articles: Model Analysis of a Reinforced Concrete Arch, by J. T. Thompson (pp. 209–220); Influence of Mineral Composition of Sand on Mortar Strength, by E. C. E. Lord (pp. 221, 222); and A Proposed Abrasion Test for Sand Investigated, by D. O. Woolf (pp. 222–224).

Farm buildings materials, D. W. MAY (*Porto Rico Sta. Rpt. 1927, pp. 4, 5, figs. 2*).—Experiments with tosca, a soft limestone coral deposit, as a building material showed that when mixed in various proportions with cement it set quickly and hardened. "A mixture as lean as 20 parts tosca to 1 part cement will harden sufficiently for wall building. The proportion of 10 to 1 was found by test to possess two-thirds the hardness of concrete. Tosca is vitreous, does not crack when drying, and therefore does not need to be reinforced with iron. The surface of the combination for use as floors may be further hardened with water glass, or such other chemicals as are used to harden concrete. Tosca mixes easily with cement and can be poured as readily as concrete."

It was also found that adobe, or sundried bricks with straw as binder, may be used as a building material in the drier parts of the island, and pisé de terre, or rammed earth, for wall building where the rainfall is more abundant.

Seasoning, handling, and care of lumber (fabricators' edition) (*Washington: U. S. Dept. Com., Natl. Com. Wood Util., 1928, pp. VI+96, figs. 40*).—This report of the fabricators' subcommittee of the National Committee on Wood Utilization, prepared by A. B. Cone, is the third of a series of four reports dealing with the subject and is concerned with the particular problems and conditions found in the fabricators' field. It reviews the conditions in the industry, particularly pointing out methods of seasoning, including air and kiln drying of lumber, and the factory waste resulting from the use of improperly or insufficiently seasoned stock.

Part 1 deals with wood as an industrial raw material and part 2 with industrial lumber and its seasoning and handling.

Plain concrete, E. E. BAUER (*New York and London: McGraw-Hill Book Co., 1928, pp. XI+346, figs. 131*).—This is a textbook and laboratory manual on plain concrete. It contains chapters on standard Portland cement; special cements; mineral aggregates; mixing water and admixtures; theories of proportioning; making of concrete; placing, finishing, and curing of concrete; field control of concrete; workability and waterproofness; high early strength concrete; estimating quantities of materials for concrete; specifications; sampling; and testing. Appendixes include a large amount of working data.

The pressures under substructures, J. H. GRIFFITH (*Engin. and Contract., 68 (1929), No. 3, pp. 113–119, figs. 4*).—In a contribution from Iowa State College a simple dynamical formulation of the laws of pressure distribution independently of molecular hypotheses of matter is presented. The proposed method, while specialized in the present case, is completely generalized so as to apply to earth resistance problems of every nature.

Ignition requirements for high-compression engines, J. T. Fitzsimmons (*S. A. E. [Soc. Automotive Engin.] Jour., 24 (1929), No. 3, pp. 306–314, figs. 15*).—The essential parts of the battery ignition system are listed, and the required mechanical and electrical properties of a system that will operate satisfactorily on high-speed high-compression engines are described. The belief is expressed that a device that will automatically advance the spark above full-throttle position when operating at low load with partly closed throttle will make possible a better carburetor setting on part throttle and result in better fuel economy at low speeds.

High compression and antiknock fuels, L. C. Lichty (*S. A. E. [Soc. Automotive Engin.] Jour., 24 (1929), No. 3, pp. 290–294, figs. 9*).—Studies conducted at Yale University are reported, which constituted an analysis of the economic value of the use of high compression from the viewpoints of fuel cost, carbon-removal cost, and engine performance.

The results indicate that the carbon-removal saving resulting from the use of a fixed doped fuel is highest for the lowest compression ratio, and vice versa. The fuel saving has a definite relationship with compression ratio and is directly proportional to the cost of fuel for any compression ratio. For a given dope, the carbon-removal saving is principally a fixed item which varies only with the cost of removing the carbon. With low fuel costs no saving seems to result from the use of doped fuels with the present compression ratios. With higher fuel costs the net saving becomes considerable. For 30-ct. gasoline a net saving of more than 150 per cent of the doped cost is shown for compression ratios varying between 6.8 and 7.8 to 1. The economy of the use of doped fuel at a compression ratio of 5 to 1 depends entirely upon carbon-removal saving, a low cost of carbon removal and long mileage before removing carbon making the use of doped fuel uneconomical, and vice versa. Under actual operating conditions at the lower speeds, the fuel economy resulting from higher compression with the existing gear ratio will be less than expected from a full-load analysis. The expected fuel economy, better performance at the higher speeds, higher maximum speed, and lower engine speeds can be obtained by decreasing the gear reduction when decreasing the compression.

Metallic colloids and knock suppression, H. L. Olin and W. J. Jebens (*Indus. and Engin. Chem., 21 (1929), No. 1, p. 43, fig. 1*).—A brief report of studies conducted at the University of Iowa is presented, in which tests were made of the antiknock properties of nickel colloids prepared at different temperatures in a laboratory engine using ordinary gasoline. The results show a successive decrease in useful compression ratio as the temperature of decomposition is raised. At 69° C., the product is nearly as effective as the fuel with undecomposed nickel carbonyl, but at 85° the improvement becomes negligible.

Data are also presented on the antiknock properties of lead colloids prepared at different temperatures.

Utilization of electric equipment on the farm, F. J. Zink and F. D. Paine (*Iowa Agr. Col. Off. Pub., 27 (1928), No. 10, pp. 53, figs. 17*).—This report on the Iowa project on rural electrification contains information and suggestions useful to farm operators and others interested in the problems connected with the use of electricity on the farm. A general summary is attached relating to the kinds of electrical equipment on 11 farms at Garner, Iowa.

Lighting is considered by the farmers to be the most important use of electricity on the farm. The electric farm motor is recognized as being more desirable than either the small stationary engine or the windmill.

Investigations in the relation of electricity to agriculture (*Oregon Sta. Bien. Rpt. 1925–26, pp. 107, 108*).—A summary is given of work done by the station on the application of electricity to agriculture as part of the work of the Oregon Committee on the Relation of Electricity to Agriculture. Special attention has been devoted to prune, hop, and walnut drying, electric lighting of poultry laying houses, and electric brooders.

Electricity on the farm (*Oregon Sta. Bien. Rpt. 1925–26, p. 39*).—In experiments on hay hoisting the results indicated that the most desirable type of hoist is one having two drums, one for the pull-up cable and the other for the pull-back cable. These drums should be geared so that the two cables travel at approximately the same speed. The results further showed that the power hoist will not put the hay into the barn much faster than will a team, but that one team and one man can be eliminated from the hay crew.

Self-cleaning thresher for single plants, J. B. Harrington (*Sci. Agr., 8 (1928), No. 9, pp. 567–569, figs. 3*).—This is a contribution from the University of Saskatchewan, which was presented at the annual meeting of the Western Canadian Society of Agronomy, Winnipeg, Man., December, 1927. It briefly describes a machine for threshing and cleaning the seed of single plants rapidly.

Portable brooder house with composition board siding, D. C. Kennard (*Ohio Sta. Bimo. Bul., 14 (1929), No. 1, p. 26, fig. 1*).—This brooder house is briefly described.

Scraper for cleaning droppings boards, D. C. Kennard (*Ohio Sta. Bimo. Bul., 14 (1929), No. 1, p. 8, fig. 1*).—A steel scraper is described and illustrated.

Refrigeration, J. A. Moyer and R. U. Fittz (*New York and London: McGraw-Hill Book Co., 1928, pp. VII+431, figs. 186*).—This is a handbook on refrigeration, including particular reference to household automatic refrigerating machines. It contains chapters on refrigeration methods, systems of refrigeration, properties of refrigerants, compressors for refrigerating plants, household mechanical refrigeration, operation of refrigeration systems, thermodynamics of refrigerating systems, refrigeration economics and plant testing, ice making, cold-storage construction, air circulation and ventilation in cold storage, cold storage of foods, and air conditioning and cooling; and an appendix on problems in refrigeration, and one containing tabular and graphic working data.

RURAL ECONOMICS AND SOCIOLOGY

[Investigations in agricultural economics at the Delaware Station, 1927–28] (*Delaware Sta. Bul. 158 (1928), pp. 7–10*).—Results of investigations are given as follows:

The marketing of Delaware sweet potatoes, C. L. Benner and H. S. Gabriel.—The investigation so far shows that during the last ten years Delaware has been losing the markets of the Middle West, that too large a proportion of off-sized and irregular-shaped potatoes are produced and sent to market, that potatoes are not strictly graded and are sold chiefly to local brokers, that the largest number of Delaware sweet potatoes go to market in December, January, and February, and that Delaware growers receive from 25 to 50 cts. per bushel less than New Jersey growers.

The taxation of Delaware farms, M. M. Daugherty.—The State's expenses increased from $580,424 in 1912 to $6,556,124 in 1927. The larger increases in expenses were general government $445,367, education $2,481,642, highway expenditures $2,170,300, developments $122,844, and social welfare $413,959. In New Castle County during the same period expenses increased from $563,542 to $1,778,139, the larger increases being general government $307,774, roads $422,423, social welfare $126,008, debt retirement $95,000, and interest $217,360. The amount realized from the real estate tax by the State increased during the period from nothing to $625,949, and by New Castle County from $361,142 to $1,440,546. The receipts of the State from the corporation and franchise tax increased $2,105,035, from business taxes $243,917, from income tax from nothing to $1,622,178, from inheritance tax $182,193, and from highway revenue $1,342,692.

It was found in one county in 1924 that the modal assessments of urban and rural property were 60 and 75 per cent, respectively, and that the larger the sale value of a property the lower the rate of assessment.

[Investigations in rural economics at the Ohio Station] (*Ohio Sta. Bimo. Bul., 14 (1929), No. 1, pp. 27–32*).—Results of investigations in rural economics are reported as follows:

The operation of large land holdings in Ohio, P. G. Minneman and J. I. Falconer (p. 27).—A table is given showing the methods of operating 123 farms of over 500 acres in 12 counties.

Farm business summaries for 1925–26–27, J. I. Falconer (pp. 28–31).—Data from 820 summaries for the three years are tabulated, as were those previously noted (E. S. R., 56, p. 285).

Index numbers of production, price, and income, J. I. Falconer (p. 32).—The table previously noted (E. S. R., 60, p. 483) is brought down through October, 1928.

An agricultural survey of the Charleston area, A. M. CARKUFF (*South Carolina Sta. Bul. 253 (1928), pp. 62, figs. 23; abs. in South Carolina Sta. Rpt. 1928, pp. 8–10, fig. 1*).—The characteristics of the area as to climate, soils, population, tenancy, land utilization, transportation, marketing, and production of truck, meats, poultry and eggs, dairy products, cotton, corn, potatoes, and other products are described. Tables are given showing for 1927 the shipments of truck from the Charleston area and the inbound shipments to Charleston by water and rail, by months, of fresh fruits and vegetables, meats and eggs, and dairy products and feeds.

Using the records obtained for 1927, an analysis was made of the organization of 50 truck farms and 53 general farms in the area. In the case of the truck farms, the 16 farms with profits of $3,000 or over compared with all the farms had an average of $9,243 less capital invested; 48 acres less in farms; 50 acres more cropped area, including second crops, of which 25 acres more were in potatoes, 11 acres more in cabbage, and 21 acres more in corn; $16 less total expenses and $6 less expenses of labor per $100 of income; 4 more work animals; 4 bbls. greater yield of potatoes and 69 crates greater yield of cabbage per acre; and $7,721 greater profits. The percentages of total receipts from potatoes and cabbage were 65 and 21, respectively, on the 16 farms, as compared with 59 and 17, respectively, on the 50 farms.

In the case of the general farms, the 12 making profits of $500 or over compared with all the farms had 69 acres more pastured; 26 acres more in cotton; 20 acres more in corn; 33 acres more in legumes; 90 acres more cropped, including second crops; 1 cow, 9 hogs, and 104 more chickens per farm; $17 less total expenses and $12 less labor expenses per $100 of income; 13 bbls. greater yield of potatoes, 12 lbs. more of cotton, and 2 bu. greater yield of corn per acre; the value of corn produced $2, potatoes $91, and all crops $15 more per acre; livestock $1,363 more per farm; and profits $3,069 more. The percentages of total receipts from potatoes, livestock, and cotton were 8, 24, and 35, respectively, for the 12 farms, as compared with 6, 21, and 43, respectively, for the 53 farms.

This study was made in cooperation with the Bureau of Agricultural Economics, U. S. D. A.

What one-third of the counties of North Carolina have done and are doing, C. B. WILLIAMS (*North Carolina Sta. Agron. Inform. Circ. 19* (*1929*), *pp. 7, fig. 1*).—An interpretation (mimeographed) of some of the 1925 census figures for 34 North Carolina counties as to crop values, fertilizer expenditures, and percentage of total cultivated acreage planted to cotton, peanuts, and tobacco.

An economic study of the apple industry of Utah, 1926–1927, W. P. THOMAS and P. V. CARDON (*Utah Sta. Bul. 208* (*1928*), *pp. 72, figs. 21*).—This bulletin presents the results of a study made in cooperation with the U. S. D. A. Bureau of Agricultural Economics as part of a national study of the apple situation. Graphs and tables are given showing the apple production and the trends of such production in the United States, Utah, and the box and barrel areas of the United States, 1910–1926; carload shipments by States, 1917–1925, and by counties from Utah, 1920–1926; the number of trees bearing and nonbearing in the United States by districts, 1910, 1920, and 1925, and in Utah by counties, 1925; the age and varieties of trees in 126 Utah commercial orchards in 1926; indexes, 1910–1927, of Utah apple prices, prices of all farm commodities, and prices paid by Utah farmers for commodities bought; the average prices by years, 1922–1926, received by Utah growers for various varieties of apples; average monthly prices, September to February, 1921–1927, at Los Angeles of different varieties and grades; average monthly distribution, 1921–1926, of carload shipments; final destination by States of carload shipments of Utah apples, 1922–1926; and the monthly cold-storage holdings of apples in the United States, November 1, 1915, to June 1, 1927.

Farm business records for 1926 were collected from 126 Utah commercial apple growers and classified into groups according to acreage in apples as follows: Group 1, 5 acres or less; group 2, 5.1 to 10 acres; and group 3, 10 acres and over. Tables are given showing by groups the size of orchards; bearing acreage; yields; prices received; cash outlays for different purposes; returns; capital invested; acreage in different crops; number of livestock of different kinds; receipts from fruits, crops, and livestock; farm expenses for different purposes; farm income; etc.

Twenty-seven special records of the costs of producing apples in Utah for the crop year 1926–27, and 30 for the crop year 1927–28 are used as the basis of tables showing different items of cost of producing, packing, and marketing apples.

The total cost of production, including operator's time but excluding packing and grading, was $115.84 per acre, or 65.5 cts. per bushel, of which 70 per cent was fixed overhead not dependent on yields. Packing, grading, and loading on cars averaged 33.3 cts. per bushel, and the average marketing cost was 9.5 cts. per bushel. The average total incomes for the different groups were group 1, $1,015; group 2, $1,013; and group 3, $1,503. The farm income and the labor income for the 10 most profitable farms were $4,386 and $3,248, respectively, and for the 10 least profitable farms, —$811 and —$2,011, respectively.

The author concludes that the indications are that the apple industry in Utah will be more stable in the next decade than in the last, as the relation between apple production and population for the United States will be more favorable during the next 10 years.

Grapefruit, H. R. WELLMAN and E. W. BRAUN (*California Sta. Bul. 463* (*1928*), *pp. 35, figs. 8*).—Tables and graphs are presented and discussed showing for a period of years the acreage of grapefruit in the United States by States and in California by counties, the trends of and seasonal variations in shipments, car unloads in important markets in 1927 by States of origin, amounts canned, trends of, factors affecting, and seasonal variations in prices, and the United States foreign trade.

The United States production was 3,511,000 boxes in 1919, 8,714,000 boxes in 1925, and 7,731,000 boxes in 1927. While the general imports decreased from 299,000 boxes in 1923 to 236,000 boxes in 1927, the shipments from Porto Rico increased from 375,000 boxes in 1919 to 462,000 and 748,000 boxes, respectively, in 1923 and 1927. Exports from the United States increased from 260,000 boxes in 1923 to 625,000 boxes in 1927. The per capita consumption in the United States was 2.4 grapefruits in 1919, 5 in 1924 and 1925, and 4.4 in 1927.

While per capita consumption and exports will probably tend to increase to some extent, normal conditions in Florida, the increase of bearing acreage in the United States, most of which is not yet in full bearing, from 66,445 acres in 1924 to 118,068 acres (estimated) in 1928, and the nonbearing acreage, estimated at approximately 44,300 acres in 1928, indicate that the present high level of prices, particularly in the winter months, will not be maintained.

Prune supply and price situation, S. W. SHEAR (*California Sta. Bul. 462* (*1928*), *pp. 69, figs. 14*).—Tables and graphs are presented and discussed showing the production of and the outlook for the production of prunes in California, the Pacific Northwest, and foreign countries; international trade; the general fruit situation; consumption of dried fruits; and the size, quality, and prices of California prunes. The problems of adjustment in the industry are discussed.

The author concludes that, on the average, prune prices for several years will be unprofitable for a large percentage of growers unless methods are improved, costs of marketing reduced, inferior grades eliminated from the market, and the costs of production materially reduced.

Irish potato outlook, South Carolina, 1929, W. C. JENSEN and A. M. CARKUFF (*South Carolina Sta. Circ. 34* (*1928*), *pp. 16, figs. 4*).—This circular discusses the acreage, production, costs of production, and demand for and prices received for potatoes with a view of guiding South Carolina farmers in making plans for 1929 plantings.

The marketing of tobacco, O. B. JESNESS (*Kentucky Sta. Bul. 287* (*1928*), *pp. 239–270*).—Included are tables showing the yearly production of different types of tobacco by States, 1923–1927, and the total for the United States, 1909–1927; production of the more important countries of the world, 1909–1913, and by years, 1924–1927; annual exports by types of leaf tobacco from the United States, 1924–1927, and to important countries, 1927; annual yields of the various United States internal-revenue taxes, 1925–1927; returns of State taxes on tobacco; use of leaf tobacco for different products, 1900–1925; and the average yearly prices of tobacco of different types sold for growers by loose-leaf warehouses in Kentucky, 1916–1927.

The organization of the trade, methods of marketing, trends in the industry, and the marketing problems are discussed briefly.

The relation of the basic-surplus marketing plan to milk production in the Philadelphia milk shed, F. F. LININGER (*Pennsylvania Sta. Bul. 231* (*1928*), *pp. 63, figs. 22*).—This study is limited to the problems of milk production arising under the basic-surplus plan and was made to ascertain (1) the relation of the average accomplishments for the region to those of certain groups of farmers in the adjusting of production, (2) the differences of degree of adjustment in different areas, (3) the influence of type of farming on the degree of adjustment, (4) how production in other sections of the State compares with that under the basic-surplus plan in the interstate territory, (5) the methods used to even up seasonal production, and (6) the influence of such methods on the cost of milk production. The data used were obtained chiefly from 591 farm records obtained through questionnaires sent out in the spring of 1926 to members of the Interstate Milk Producers' Association; from records of that association; from records of 76 cow testing associations from 1921 to 1927, inclusive, covering 9,518 cows; and from records from 5,317 cows of feed consumed by 3-month periods for the years 1925, 1926, and 1927.

Tables and charts are given showing by areas and by types of farming in the interstate territory the size of farms; acreages in crops and pasture; number of dairy cattle; receipts from crops, milk, and livestock, poultry, and eggs; and the monthly variations in milk production per farm, October to September, inclusive, 1921–22 and 1924–25, and from October, 1925, to June, 1926, inclusive.

The percentage of the total production sold at the basic price increased from 78 per cent in 1920 to 92 per cent in 1925, and decreased to 88 per cent in 1927. From 1921 to 1925 the monthly range in production decreased from 54 to 23 per cent of the average monthly production. From 1925 to 1927 it increased to 41 per cent.

Other tables and charts based on cow testing association records show that for the basic-surplus plan and the nonbasic producers in the interstate territory and for the western and northern territories of the State the pounds of milk produced per cow per year, 1922–1927, and the percentage distribution of annual production; and for the basic-surplus plan and the nonbasic producers in the interstate territory the percentages of annual production and of fat in milk in each quarter of the year of the cows freshening in the different months.

Eighty-two per cent of the farmers reporting attempted to increase the basic amount of milk by having cows freshen in the fall, 70 per cent by increasing the feed in the fall, and 27 per cent by purchasing cows in the fall. Twenty-one per cent decreased the surplus milk by feeding milk to farm animals, and a like per cent by selling cows.

Tables and charts are given showing by the basic-surplus plan and the nonbasic producers in the interstate territory and for the western and northern territories the variations by quarters of the year in the pounds of grain fed per cow; the number and percentage of cows freshening from August to November each year from 1922 to 1927, inclusive; and the milk production and feed consumed by cows freshening in different months.

The place for the combined harvester-thresher, M. L. Wilson, S. E. Johnson, E. A. Starch, and E. J. Bell, jr. (*Montana Sta. Rpt. 1927, pp. 71, 72*).—The average costs per acre of operating combines on 60 farms studied in the Judith Basin were man labor 28.3 cts., fuel 28.2, oil 4.6, repairs 4.1, depreciation 84.9, interest 16, and tractor 50 cts., making a total of $2.16 per acre, or 13.7 cts. per bushel of grain, a saving of more than 8 cts. per bushel over the cost with harvesters and threshers. Field losses averaged 2.6 per cent for combines, 3.8 per cent for headers, and 6.1 per cent for binders. Threshing losses averaged 1.9 per cent for combines and 1.1 per cent for stationary threshers.

Crops and Markets, [January, 1929], (*U. S. Dept. Agr., Crops and Markets, 6 (1929), No. 1, pp. 32, figs. 3*).—The usual tables, graphs, reports, summaries, and notes are included. Special tables are given showing the results of the December 1, 1928, pig survey and the estimated aggregated value, by States, of 22 crops for December 1, 1928, with comparisons for 1919 and 1927.

Statistics of fats, oils, and oleaginous raw materials (*U. S. Dept. Agr., Statis. Bul. 24 (1928), pp. 88, figs. 5*).—Statistics are included of the annual production in the United States and foreign countries; the yearly imports and exports of leading countries; imports, exports, and reexports of the United

States by months; prices by months at important markets; revenue derived from tariff in the United States by years, 1913–1926; and the annual supply and distribution in the United States of over 20 oleaginous raw materials and about 40 vegetable and animal oils, fats, and greases. In general the statistics are for the years 1913 and 1919–1926.

FOODS—HUMAN NUTRITION

The Japanese Imperial Government Institute for Nutrition, F. O. Santos (*Philippine Agr., 17 (1928), No. 5, pp. 215–221*).—This is a description of the origin of this institute, its buildings, research staff, equipment, and program of work, with a brief note on the organization and work of the Japan Nutrition Association, which at present is furnishing school lunches to more than 10,000 public school children. The published reports of some of the investigations which have been completed at the institute for nutrition have been listed previously (E. S. R., 60, p. 290).

[Food, nutrition, and diet] (*Amer. Med., n. ser., 23 (1928), No. 11, pp. 751–929, figs. 14*).—This entire issue of this journal, including editorials, original articles, and book references, is devoted to the general subject of foods and nutrition. The original articles and authors are as follows: Supplementary Relations Among Nutritive Values of Foods, by H. C. Sherman (pp. 767–770); Accessory Dietary Essentials—Vitamins, by G. R. Cowgill (pp. 771–780); The Relation of Vitamin B Deficiency to Infant Mortality, by B. Sure (pp. 781–786); Milk and Medical Science, by J. A. Tobey (pp. 786–792); Effectual Control of Milk Supplies, by J. W. S. McCullough (pp. 792, 793); The Superiority of Whole Wheat Bread, by J. F. Lyman (pp. 794–798); Protein in Nutrition, by T. S. Harding (pp. 798–803); Minerals and Metabolism, by E. Browning (pp. 803–806); The Importance of the Mineral Constituents in Diet, by G. W. Clark (pp. 807–811); The Acids of Fruits, by E. K. Nelson (pp. 812–815); Diet in Health and Disease, by V. E. Levine (pp. 815–826); The Influence of Nutrition on General Health, by E. E. Marcovici (pp. 826–837); Sugar-Saturated, Vitamin-Starved America, by S. Harris (pp. 837–844); The Effect of the Manner of Eating on Digestion, by W. E. Fitch (pp. 844–852); Aids to Adequate Infant Feeding, by C. U. Moore (pp. 852–857); The Use of Concentrated Foods in Infant Feeding, by J. L. Rogatz (pp. 858–864); Suggestions for Simplifying Infant Feeding, by W. A. McGee (pp. 864–867); Food Allergy in Infants, by B. Ratner (pp. 868–870); Malnutrition: Its Dietetic Management, by G. W. Kutscher, jr. (pp. 871–874); Anorexia Nervosa, by H. M. Greenwald (pp. 875–880); A Few Reflections on the Present Position of Infant Feeding in England, by E. Pritchard (pp. 881–883); Facts and Fancies in Digestive Tract Diets, by P. B. Davidson (pp. 883–890); The Low Residue, High Caloric Diet, by G. E. Knappenberger (pp. 890–895); The Dietary Factor in the Treatment of Tuberculosis, by D. C. Martin (pp. 895–903); The Diet in Cases of Myovascular Insufficiency, Hypertensive Group, by C. J. Brim (pp. 903, 904); Newer Clinical Knowledge Pertaining to Insulin, by E. S. Du Bray (pp. 904–907); Diet and Insulin in the Treatment of Uncomplicated Diabetes, by F. S. Modern (pp. 907–913); Some Skin Manifestations and Their Relations to the Disturbances of the Gastrointestinal Tract, by L. Spira (pp. 913–918); and The Importance of Allergy in Prescribing Diets, by E. Hollander (pp. 918–920).

Food and health, D. Dickins (*Mississippi Sta. Bul. 255 (1928), pp. 20, figs. 4*).—A popular presentation of the lessons to be learned from the quantitative food consumption reported previously (E. S. R., 59, p. 189), with suggestions for improving the diet of the families studied.

The influence of food upon longevity, H. C. Sherman and H. L. Campbell (*Natl. Acad. Sci. Proc., 14 (1928), No. 11, pp. 852–855*).—A statistical study is reported of the duration of life of about 200 rats upon each of the two diets used so extensively in the authors' laboratory, diet A consisting of ⅙ dried whole milk and ⅚ ground whole wheat, and diet B of ⅓ dried whole milk and ⅔ ground whole wheat, with salt to the extent of 2 per cent of the weight of the wheat.

The rats on diet A consisted of 92 males and 128 females and on diet B 80 males and 99 females. With both males and females the average duration of life was about 10 per cent longer upon diet B than upon diet A, the exact figures being 59±16 days for males and 60±16.2 for females. The difference between the mean lengths of life upon the two diets was 3.7 times its probable error. Distinct differences in favor of diet B were also shown in comparisons of the median length of life and the percentages of individuals living over 800 and 900 days.

Attention is called to the fact that the poorer of the two diets is adequate although not optimal, and that probably the better of the two is capable of improvement.

Nutrition and longevity (*Jour. Amer. Med. Assoc., 92 (1929), No. 1, pp. 57, 58*).—An editorial comment on the investigation noted above, with special emphasis on the fallacy of the view that heredity alone plays a part in longevity.

Stimulation of growth of school children by small supplementary feedings, A. F. Morgan and L. Warren (*Amer. Jour. Diseases Children, 36 (1928), No. 5, pp. 972–978*).—This study of supplementary feeding of school children differed from preceding ones in the series (E. S. R., 58, p. 593) in that the school selected was one in which the children were all of a low economic status and presumably were not getting sufficient food at home. The supplementary lunches given three comparable groups of from 40 to 50 children each were ½ pint of pasteurized whole milk, one large orange, and two soda crackers with sugar filling, the different materials furnishing 160, 80, and 125 calories, respectively. The feeding was continued for 10 weeks, with physical examinations and measurements of weight and standing height at the beginning and end of the period. At the beginning about half of each group were more than 7 per cent underweight for height and age as judged by the Baldwin-Wood standards, while in the control group receiving no supplementary feeding there were only 3 children who were more than 7 per cent underweight.

The average percentages of the expected gains for the four groups were milk 104, orange 76, crackers 102, and no supplement 22. The much higher gains of the milk and cracker groups are thought to indicate that the greatest need of these children was for extra calories. The authors are of the opinion that the best type of food for the supplementary feeding of undernourished children can not be selected without careful consideration of the prevailing home conditions. The results obtained led to the recommendation of milk or crackers or preferably both as the supplementary lunch.

Health studies of negro children.—II, The physical status of the urban negro child: A study of 5,170 negro school children in Atlanta, Ga., E. B. Sterling (*Pub. Health Rpts. [U. S.], 43 (1928), No. 42, pp. 2713–2774, figs. 29*).—In this detailed report of the results of a study of the physical status of over 5,000 negro school children of Atlanta, Ga., comparisons are included of various measurements of boys and girls in the present study with reported data for rural negro children of the same age and sex and for urban white children.

Among the many points brought out are the comparative freedom from dental caries, 64 per cent of the children having excellent or good teeth, the low incidence of goiter, and the comparatively low previous incidence of rickets. As judged by the clinical evidence obtained, 45 per cent of the entire number were in a state of good or excellent nutrition, 35 per cent fair, and 20 per cent poor nutrition. More girls than boys were in the good nutrition group at all ages.

The rural negro children of school age were in general slightly taller and heavier than the Atlanta urban negro children of the same age. The growth relationships of the sexes in the white and negro children were different. The negro girls exceeded the negro boys in height much earlier and in weight slightly earlier than was the case with white girls and boys. After the age of 6 the white boys were slightly taller and heavier than the Atlanta negro boys, and the negro girls than the corresponding white girls.

A list of 41 references to the literature is appended.

A nutrition investigation of negro tenants in the Yazoo-Mississippi Delta, D. Dickins (*Mississippi Sta. Bul. 254 (1928), pp. 52, figs. 15*).—This study of the food habits of negro tenants in four typical counties of the Yazoo-Mississippi Delta was conducted by the inventory method, daily records being kept for a month by the housewives enrolled under the supervision of two intelligent negro women in each of the four counties. In all, records were obtained for 80 negro families, 78 tenants and 2 renters, including 386 individuals. The study was made during the last half of February and the first half of March, 1927. During February the negro tenant is usually without supplies from the landlord, while in the working season beginning March 1 he receives cash and supplies. The methods followed in analyzing the data were essentially the same as those in the previously reported dietary study conducted among white families in two sections of Mississippi (E. S. R., 59, p. 189), and the results obtained have been compared with this and also with an earlier study of Atwater and Woods of the food of the negro in Alabama (E. S. R., 9, p. 160).

The dietaries were much lower in energy value and in protein, calcium, phosphorus, and iron than those of the white families studied. The average values were 95 per cent of the usual standard for energy, 85 per cent for protein, 77 for calcium, 75 for phosphorus, and 81 per cent for iron. The dietaries were composed largely of cereals, fats, and sweets, only 44 per cent of the money value of the food coming from the farm. Milk did not appear at all in 12.5 per cent of the records and in all furnished only 8.7 per cent of the total calories. Of the other food groups, meat, eggs, and cheese furnished 3.5 per cent of the total calories, fatty foods 29.6, sweets 11.5, cereals and breads 41.2, and fruits and vegetables only 5.3 per cent.

There seemed to be little difference in the dietaries of families living on plantations in which the settlement was in supplies from those receiving cash settlement or cash and supplies. The average money value of the food consumed per man per day was 21 cts., with an average expenditure of 32 per cent of the income.

The author is of the opinion that "these dietaries offer one explanation for the high death rate, frequent illnesses, lack of energy, lowered resistance to infectious and contagious diseases, of negroes in Mississippi. They explain, at least in part, why pellagra occurs so frequently in the Delta counties and among negroes in particular." It is stated that in localities in which home demonstration work has been well established there has been marked improvement in the extent to which food is produced on the farm.

Polish food habits, M. Morzkowska and L. McLaughlin (*Jour. Amer. Dietet. Assoc., 4 (1928), No. 3, pp. 142–148*).—Data are reported on the food consumption of a representative family of the peasant class and one of the squire class in Poland, of a group of 30 girls and 3 teachers in a school of domestic science, and of the inmates of a girls' and a boys' orphanage. The data for the family groups were obtained by weighing the food daily for 2 weeks and for the other groups from detailed records kept by the institution housekeepers. Differences for age, sex, and activity were calculated on the unit basis according to the recommendations of Hawley (E. S. R., 58, p. 84).

According to the accepted standards, the diet of the squire's family was adequate in all respects, of the peasant family slightly low in energy value, and of the domestic science group slightly low in energy, protein, and phosphorus and very low in calcium. The orphanage diets were very low in total energy value and deficient in nearly every respect, although in one of them the diet would have been adequate in other respects if of sufficient energy value. Calculations of the distribution of energy by classes of food showed a very low content of fruit and vegetables in the orphanage diets and of efficient protein in one of the orphanage groups and in the domestic science group.

General information is included on Polish food customs.

The chemical composition of Philippine fishes, A. N. Balagtas (*Philippine Agr., 17 (1928), No. 5, pp. 253–261*).—Proximate analyses are reported for over 30 varieties of fish obtained from local markets in Los Banos and Manila, P. I. Descriptions are included of representative samples.

Cooking beef according to the cut, L. M. Alexander and F. W. Yeatman (*U. S. Dept. Agr. Leaflet 17, rev. (1928), pp. 8, figs. 7*).—In this revision of the leaflet previously noted (E. S. R., 58, p. 491) additional recipes are given for mushroom sauce, Yorkshire pudding, Swiss steak, broiled Hamburg steak on onion rings, and beef croquettes.

Baking bread at a high altitude (*Wyoming Sta. Rpt., 1928, pp. 154, 155*).—This progress report brings out the fact that cracks in the crust of bread baked at high altitudes are due in part to relatively low humidity and may be avoided by increasing the humidity in the proofing chamber and oven.

How the experimental baking test has developed, C. L. Brooke and R. C. Sherwood (*Cereal Chem., 5 (1928), No. 5, pp. 366–374.*)—This is a brief review of the literature on the subject, including references as early as 1849. The earlier tests were made for the purpose of determining only the yield of bread. The tendency of European workers has been toward the development of a test in which a small quantity of flour is used to produce a loaf having characteristics analogous to those of the larger loaf. In general a uniform procedure is followed except that the amount of water is varied. In the United States there have been two main tendencies, (1) to determine the maximum volume that a flour will yield, in some cases with the addition of stimulants to a large percentage of yeast, and (2) the attempt to vary the baking procedure, particularly fermentation time, in such a way as to produce an ideal commercial loaf. The present tendency is to establish fixed conditions for the baking test, with flour as the only variable.

The mechanical method of modification of dough, C. O. Swanson (*Cereal Chem., 5 (1928), No. 5, pp. 375–385*).—On the basis of tests of different flours by various cereal chemists, the conclusion is drawn that the mechanical method of modification of flour according to the method and apparatus devised by the author (E. S. R., 55, p. 692) is of greatest value in baking tests in revealing weaknesses in the new and unknown varieties of wheat, but is more severe than necessary in testing commercially important wheats. The mechanical method is considered by the author to indicate fermentation tolerance indirectly as far as this is related to the quality of the gluten material. As a test for protein it is thought to indicate quality rather than quantity, and thus to give results differing considerably from those obtained by the conventional methods.

A study of the factors affecting the jellation of fruit juices and pectin solutions, P. B. Myers and G. L. Baker (*Delaware Sta. Bul. 158 (1928), pp. 18, 19*).—This progress report on a continuation of the investigation previously noted (E. S. R., 57, p. 592) deals with the effect of time of boiling and of acidity on the extraction of pectins from lemon albedo, previously leached in alcohol, dried, and ground.

On boiling this material with water or water containing acid, it was found that a rapid hydrolysis of the pectin with subsequent decrease in its jellying power occurred with increase in the time of boiling, particularly during the first 15 or 20 minutes. The yield of pectin, however, increased with the time of boiling during the extraction, the maximum increase occurring during the same time interval (15 or 20 minutes). "Obviously the time to boil the pectic material during extraction is therefore at that point where the product of the yield times the parts of sugar one part of pectin will support is the greatest, for at that point the greatest quantity of jelly is obtained."

The quality and yield of pectin were found to be determined by the H-ion concentration rather than the total titratable acidity of the extracting medium. With an increase in the H-ion concentration the quality of the resulting pectin increased to a maximum and then decreased abruptly. The most favorable reaction for jellying was at approximately pH 2.45. The yield of pectin increased with increase in H-ion concentration.

Cut-out tests on canned fruits (*Oregon Sta. Bien. Rpt. 1925–26, p. 89*).—Cut-out tests on fruits canned during a single season following the standard methods of the Northwest Canners Association showed very little variation in the cut-out of the sirup from the beginning to the end of the picking season. This is attributed chiefly to the fact that various crops of fruit are coming in at different times, making the percentage of ripe and partly ripe fruit approximately the same throughout the season.

Effect of spray upon perforation in canned goods (*Oregon Sta. Bien. Rpt. 1925–26, p. 90*).—Sulfur spray residues on gooseberries and cherries were found to cause a high percentage of spoilage of the fruit through perforation when canned.

Studies on colour tests for sterols and vitamin A, I, II, F. Wokes (*Biochem. Jour., 22 (1928), Nos. 3, pp. 830–835; 4, pp. 997–1006, figs. 3*).—In the first of these papers, Sterol Tests, a comparison of various color tests for sterols and for vitamin A has shown that blue colors differing from those produced with solutions containing vitamin A only in their greater stability and in the order of color change may be obtained from sterols and certain derivatives with antimony pentachloride, acetic anhydride and concentrated sulfuric acid, vitamin reagents on ergosterol in high initial concentration, and vitamin reagents on sterols treated with oxidizing agents, formaldehyde, or acetic anhydride. Irradiation of the sterols may cause the colors to become more transient. In some cases the sequence of colors is from red to blue, while in others the sequence is from blue to red as in the vitamin A tests.

Mixed oxidation products of cholesterol yield with vitamin reagents blue colors gradually changing to red. Attempts to isolate pure substances giving initial blue colors have been unsuccessful, only red chromogens being obtained.

In the second paper, A Spectroscopic Study of the Colorations Attributed to Vitamin A, the author reports a spectroscopic study of the colors produced by arsenic and antimony trichlorides on a series of cod-liver oils and concentrates whose vitamin A content had been determined by feeding tests. The rapidity with which the color fades in the arsenic trichloride test made it necessary to work very rapidly, and the results obtained were not as clear cut as with the antimony trichloride. In each case, however, two characteristic absorption bands were obtained, the initial bands being at about 587$\mu\mu$ for arsenic trichloride and 614$\mu\mu$ for antimony trichloride and the second bands at 475 and 530$\mu\mu$, respectively. A gradual change was noted from the stage giving the initial to that giving the final band, the change being accompanied by a gradual and measurable loss in blue color and gain in red color.

The importance is emphasized of taking into account the time factor in any study of vitamin color reactions. Attention is also called to the fact that the color tests have thus far been obtained "not on pure substances but on oils and concentrates of complex composition, probably containing a number of different sterol derivatives. A direct connection has still to be proved between the vitamin and the chromogen responsible for the characteristic absorption bands here described. The blue colors attributed to vitamin A, and the absorption bands which have now been shown to characterize them, can not be considered specific until they can be obtained from a definite chemical compound which possesses the physiological properties of the vitamin."

Vitamin A as an anti-infective agent, H. N. GREEN and E. MELLANBY (*Brit Med. Jour., No. 3537 (1928), pp. 691–696*).—Following a review of the literature on the relationship between lack of vitamin A and susceptibility to various infections, the authors present tabulated data showing the incidence of xerophthalmia, tongue abscesses, infection of the alimentary tract, kidney infection, bladder stone, and bladder infection in 45 rats kept until death on a diet lacking in vitamin A, but with vitamin D furnished by irradiated cholesterol or radiostol. Data are also given for smaller groups on diets deficient in vitamin D as well as vitamin A and with various added substances.

Among the entire number of 93 vitamin A-deficient animals examined, all showed lack of adipose tissue and general visceral atrophy and all but 2 showed evidence of infection in some site. Abscesses at the base of the tongue, as noted by Sherman and Munsell (E. S. R., 54, p. 89), were found in 72 per cent of the entire number and in 90 per cent of those surviving for longer periods than the average. Infection of the lungs occurred in only 9 per cent, while xerophthalmia was evident in over 38 per cent, infection of the alimentary tract in 21, infection of the kidney or bladder in 44, and pus in the nasal sinuses or middle ear in 20 per cent. In none of the 50 control animals receiving vitamin A in the form of dried cabbage, cod-liver oil, or butter was there any evidence of such infection. In a series of several hundred rats receiving adequate vitamin A and little or no vitamin D only two instances of gross infection were found.

These results are thought to give further confirmation to the significance of vitamin A in raising bodily resistance to infection. It is suggested that the effect may be due solely to the favorable medium for bacterial growth provided by obstruction as a result of desquamated keratinized cells or to a combination of this and a diminished resistance to infection. The possibility is suggested of a similar relationship to lack of vitamin A of the common suppurative processes found in man.

Sparing action of fat on the antineuritic vitamin, H. M. EVANS and S. LEPKOVSKY (*Science, 68 (1928), No. 1761, p. 298*).—A brief note stating that a level of antineuritic vitamin can be found on which all rats receiving no fat die in slightly over a month, while those receiving 10 per cent of fat live more than four months. Vitamin G and the fat-soluble vitamins A, D, and E were present in the diets used, and vitamin F could not be detected in the fats. This is thought to indicate the sparing action of fat for vitamin F in certain unknown metabolic processes.

Effect of storage on vitamin C in potatoes, J. E. RICHARDSON and E. JACOBS (*Montana Sta. Rpt. 1927, pp. 78, 79*).—In this progress report it is stated that Montana grown potatoes proved to be particularly rich in vitamin C as compared with potatoes tested in the Eastern States, and that there was no appreciable loss in vitamin C during eight months' storage in well-ventilated storage cellars. With an average temperature of 40° F. and a relative humidity of 96 per cent potatoes cooked in the early period of storage appeared to be about one-fourth as rich in vitamin C as raw potatoes, but after six months' storage proved unexpectedly to be practically as rich in vitamin C after cooking as an equivalent amount of raw potatoes.

The colour reactions of substances containing vitamin D, W. A. SEXTON (*Biochem. Jour., 22 (1928), No. 4, pp. 1133, 1134*).—The color reaction with aniline hydrochloride and aniline suggested by Shear[2] as specific for vitamin D has been found to be nonspecific for this vitamin, but to be given by the singly unsaturated ketones, as well as by irradiated ergosterol and cod-liver oil. This is in harmony with the theory that vitamin D is possibly a ketone, although it is pointed out that the ketone which may be produced during the irradiation of ergosterol is not necessarily the vitamin.

The phosphomolybdic acid reagent proposed by Bezssonoff as a color reagent for vitamin D (E. S. R., 52, p. 313) was found to give no color with irradiated ergosterol and hence to be nonspecific for vitamin D.

The action of X-radiation upon vitamin D in activated ergosterol, R. R. MORRISON, P. R. PEACOCK, and S. WRIGHT (*Biochem. Jour., 22 (1928), No. 4, pp. 1138–1141*).—Partial destruction of antirachitic activity was demonstrated in irradiated ergosterol after exposure to large doses of X-rays.

Activated ergosterol in the treatment of rickets, S. KARELITZ (*Amer. Jour. Diseases Children, 36 (1928), No. 6, pp. 1108–1120, figs. 9*).—Essentially noted from a preliminary report (E. S. R., 59, p. 595).

Some biochemical relations of phenols.—I, Hydroquinone, R. C. HUSTON and H. D. LIGHTBODY (*Jour. Biol. Chem., 76 (1928), No. 2, pp. 547–558, figs. 3*).—This paper describes three experiments selected from a series planned to determine the effect of hydroquinone upon the growth and bone development of albino rats fed diets of the rickets producing type.

In the first series the basal diet consisted of casein 20, dextrin 56.6, hydrogenated cottonseed oil 14, McCollum salt mixture modified to contain 0.8 per cent ferric chloride 3.9, calcium carbonate 1.5, butterfat 1, and dried yeast 3 per cent. This was modified by the substitution of some of the dextrin by an equal weight of hydroquinone to the extent of 0.01, 0.025, 0.05, 0.1, and 0.5 per cent of the diet. These amounts gave a progressive protection against ophthalmia, no definite cases being observed at concentrations of 0.1 per cent or above and an increase in growth rate up to 0.1 per cent, beyond which there was a reduction in growth rate.

In the second experiment the same basal diet was modified by replacing some of the dextrin by 3 per cent cod-liver oil or 0.05 per cent hydroquinone or a combination of the two. In one experiment with each of these additions the casein and dextrin were irradiated. The growth curves showed values for the combination of cod-liver oil and hydroquinone approximately the same as for cod-liver oil and irradiation and superior to cod-liver oil alone. The growth curves for hydroquinone and hydroquinone and light were intermediate between those of cod-liver oil and cod-liver oil plus hydroquinone. Ratios of the average bone ash to organic residue and the percentages of total ash, calcium, and phosphorus at 28 days were higher on all of the experimental diets than on the control diet, but the fat content was lower.

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[2] Soc. Expt. Biol. and Med. Proc., 23 (1926), No. 7, pp. 546–549.

The third experiment was a preliminary one to determine the effect of 0.05 per cent hydroquinone substituted for dextrin on the growth of rats fed the McCollum rachitic diet 3408. There was definite protection against ophthalmia but no growth.

A study of the blacktongue-preventive action of 16 foodstuffs, with special reference to the identity of blacktongue of dogs and pellagra of man, J. Goldberger, G. A. Wheeler, R. D. Lillie, and L. M. Rogers (*Pub. Health Rpts. [U. S.], 43 (1928), No. 23, pp. 1385–1454*).—Detailed reports are given of the efficacy of various foods in the prevention of experimental blacktongue in dogs. The 16 foods studied included 11 which had previously been studied for pellagra-preventive action on human subjects. The results with these were consistent in showing comparable effects on pellagra and blacktongue. The materials not studied previously for pellagra-preventive action included cottonseed oil, which proved to be a poor source of the blacktongue-preventive factor, and canned salmon, egg yolk, and pork liver, all of which contained the blacktongue-preventive factor. On the basis of the similarity in effect for blacktongue and pellagra of the other materials, these are also recommended for the treatment of human pellagra.

A study of the tissue changes in experimental black tongue of dogs compared with similar changes in pellagra, J. Denton (*Amer. Jour. Path., 4 (1928), No. 4, pp. 341–352, pls. 3*).—The gross pathology and histology of a graded series of early and late cases of experimental blacktongue of dogs serving as test animals in the above-noted studies of Goldberger et al. are described, and compared with similar data obtained previously by the author on a number of cases of human pellagra.

The lesions of the skin, mouth, pharynx, esophagus, and colon in pellagra and in blacktongue showed very similar gross and microscopic appearances. The lesions of both appeared to originate in degenerative processes in corresponding tissue elements and to show the same tendency to secondary infection.

The distribution of Bacillus botulinus in Scottish soils, G. Leighton and J. B. Buxton (*Jour. Hyg. [London], 28 (1928), No. 1, pp. 79–82*).—In an examination for spores of *B. botulinus* of 100 soil samples from cultivated gardens, plowed fields, pasture land, and moorland in different counties in Scotland, one sample from plowed land and one from old pasture land were found to contain spores of Type A, one from hill pasture soil Type B, and one from old pasture soil both A and B. Attention is called to the fact that this is the first time that Type A has been found in European soil.

TEXTILES AND CLOTHING

A method for measuring the "drag" of cotton fibers and the relation of certain physical properties of the cotton fiber to yarn quality, J. H. Moore (*North Carolina Sta. Tech. Bul. 33 (1928), pp. 43, figs. 15*).—Drag is described as the resistance overcome in pulling apart a sample of ginned cotton. By using a method devised for measuring drag in mathematical terms, the relation of drag to spinning value was investigated in two bales of cotton grown in North Carolina in 1926 from seed of known varieties. The bale with weak drag, designated as No. 1, was described by mills as soft, and the bale (No. 2) with strong drag was indicated as harsh cotton. Spinning tests were made in cooperation with the North Carolina State College Textile School.

Measurement of drag made from samples of the bales in the raw state after carding, drawing, and roving were concluded showed a difference persisting throughout, although the contrast was not so great after drawing as was noted in hand-carded samples. When sliver from the cards was measured after exposure to different percentages of humidity, the strength of drag decreased as the humidity increased. After mechanical twist was given the sliver the stronger drag did not give an advantage in strength, since yarns from the bale with weak drag were the stronger. This was also noted in spinning tests on other bales. While bale No. 2 contained slightly more waste, no other difference was noted in the running quality of the bales.

Tests of yarns from the bales showed that an increase in humidity was associated with a pronounced increase in the strength and stretch of both bales, especially the strength of yarns from the bale with stronger drag. At the humidity percentages used the strength and stretch of yarns from the bale with weaker drag considerably surpassed those in the yarns of the other bale. The bale with weaker drag was found to produce stronger yarns at both the minimum and maximum turns per inch in counts ranging from 26s to 35s. An increase in turns per inch above the minimum was accompanied by a greater increase in the strength of yarns from the bale with stronger drag.

Fibers of the bale with weak drag were more uniform in length, slightly less in average length, wider in ribbon width, and showed considerably less development of fiber walls, the observations indicating that development of fiber walls and drag are associated. However, the data from all completed tests described indicate that high strength of drag is not an important factor in yarn strength and the running quality of cotton.

The shrinkage of wool (*Wyoming Sta. Rpt. 1928, pp. 156, 157*).—A sample of wool weighing from 3 to 5 lbs. was chosen from the clip from one band by taking small handfuls at random from about 50 fleeces; after half an hour or later a second sample was taken. Scouring studies by R. H. Burns on duplicate samples from 26 bands of sheep suggested that this method of testing samples might be quite valuable in indicating the shrinkage of a clip.

MISCELLANEOUS

Report of the Alaska Agricultural Experiment Stations, 1927, H. W. Alberts (*Alaska Stas. Rpt. 1927, pp. [2]+40, figs. 19*).—This contains the organization list and a report of the several lines of work carried on. Meteorological data and accounts of the extensive tests with field and garden crops and of the work with cattle and bees are abstracted elsewhere in this issue.

Report of the director [of Connecticut State Station] for the year ending October 31, 1928, W. L. Slate (*Connecticut State Sta. Bul. 298 (1928), pp. 113–139, figs. 11*).—The work of the station during the year is briefly reviewed. The experimental work reported not previously noted is abstracted elsewhere in this issue.

Annual report of the director for the fiscal year ending June 30, 1928, C. A. McCue et al. (*Delaware Sta. Bul. 158 (1928), pp. 43, figs. 3*).—This contains the organization list, a report of the director including a financial statement for the fiscal year ended June 30, 1928, and departmental reports. The experimental work recorded not previously noted is for the most part abstracted elsewhere in this issue.

Some outstanding accomplishments of the Montana Agricultural Experiment Station: Thirty-fourth Annual Report, [1927], F. B. Linfield et al. (*Montana Sta. Rpt. 1927, pp. 104, figs. 13*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1927, and a report of the director and heads of departments on the work of the station. The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

Director's Biennial Report [Oregon Station], 1924–1926, J. T. JARDINE (*Oregon Sta. Bien. Rpt. 1925–26, pp. 133*).—This contains the organization list and a report of the director for the biennium ended June 30, 1926, including synopses of departmental reports and notes on the substations. The experimental work reported is for the most part abstracted elsewhere in this issue.

Report of the Porto Rico Agricultural Experiment Station, 1927, D. W. MAY ET AL. (*Porto Rico Sta. Rpt. 1927, pp. [2]+31, figs. 6*).—This contains the organization list, a report of the director as to the general conditions and lines of work conducted at the station during the year, and reports of the assistant chemist, horticulturist, plant breeder, agriculturist, plant pathologist, and parasitologists. The experimental work is for the most part abstracted elsewhere in this issue.

Forty-first Annual Report of the South Carolina Experiment Station, [1928], H. W. BARRE (*South Carolina Sta. Rpt. 1928, pp. 95, figs. 33*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1928, and a report of the work of the station during the year. The experimental features reported not previously noted are for the most part abstracted elsewhere in this issue.

Annual Report of the Western Washington Experiment Station, [1928], J. W. KALKUS ET AL. (*Western Washington Sta. Bul. 10–W (1928), pp. 52, figs. 4*).—This contains the organization list, a report by the superintendent, and departmental reports. The experimental work not previously noted is for the most part abstracted elsewhere in this issue.

Thirty-eighth Annual Report of [Wyoming Station, 1928], J. A. HILL (*Wyoming Sta. Rpt. 1928, pp. 133–171*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1928, a report of the director on the work of the station, and meteorological observations by F. E. Hepner (see p. 711). The experimental work reported is for the most part abstracted elsewhere in this issue.

The Panhandle Bulletin (*[Oklahoma] Panhandle Sta., Panhandle Bul. 1 (1929), pp. 15*).—The initial number of this publication, which is to be issued monthly, contains an announcement and the following articles: New Varieties of Grain Sorghums, by H. H. Finnell (pp. 4–7); Ten Don'ts for Ordering Nursery Stock, by J. H. Painter (pp. 8, 9); Breeding Livestock on the Farm, by O. S. Willham (pp. 10–13); and Fall Freshening of Dairy Cows, by J. K. Muse (pp. 13–15).

Some Pennsylvania pioneers in agricultural science, T. I. MAIRS (*State College, Pa.: Author, 1928, pp. 185, pls. 12*).—This book is noted editorially on page 706.

NOTES

Connecticut College.—Dr. George A. Works, dean of the School of Library Science at the University of Chicago, has accepted the presidency of the college.

Delaware Station.—H. G. Butler, assistant entomologist, resigned March 15 to accept a position with the U. S. D. A. Bureau of Entomology and was succeeded on April 1 by L. L. Williams.

Idaho University and Station.—C. B. Ahlson resigned March 1 as field agronomist and State seed commissioner to engage in commercial work. On April 1 he was succeeded by John D. Remsberg, jr., assistant professor of agriculture at the southern branch of the university at Pocatello and assistant agronomist of the station, and he in turn by Eugene Whitman, a 1928 graduate of the university.

Massachusetts College.—The State appropriations for the fiscal year ending November 30, 1929, aggregate $992,610 for maintenance and $113,750 for special construction and equipment. The grant for current maintenance is the largest in the history of the institution and exceeds the present allotment by $45,750. The items included are $327,800 for college instruction, $262,200 for general maintenance, $50,000 for administration, $98,200 for the station, $96,500 for the extension service, $70,910 for control and laboratory service, $74,100 for short courses, and $12,900 for the Market Garden Field Station. The appropriations for special construction and equipment include $70,000 for a building and equipment for horticultural manufactures, $14,000 for an abattoir for animal husbandry, $10,000 tor road construction, and the remainder for miscellaneous repairs, minor construction, and similar purposes.

C. O. Cartwright, instructor in horticultural manufactures, has resigned to engage in commercial work.

Michigan Station.—Dr. I. F. Huddleson, research associate in bacteriology (veterinary science), has been granted four months' leave of absence beginning May 1 for a study of the contagious abortion-Malta fever problem in the Mediterranean region for the U. S. Public Health Service. C. W. Duncan has been appointed assistant in agricultural chemistry, effective May 1.

Pennsylvania College.—The legislature has appropriated $6,311,000 for the institution, of which $2,250,000 is for new buildings. There is also allotted $300,000 for agricultural research, $650,000 for agricultural and home economics extension, $711,000 to meet a deficit, and $2,350,000 for general college maintenance.

Plans are being prepared for the reconstruction of Old Main, the central building, now 70 years old, and its utilization as a center for college administration and student activities. A recreational building has been completed at a cost of approximately $500,000, as have also a $115,000 infirmary and a sheep barn. A new engineering unit, an additional section of the Pond Chemical Laboratory, and the Grange Memorial Dormitory for girls are under construction, and the early erection of one wing of the new botany building and a men's dormitory is contemplated.

The two-year agricultural course is to be revised to permit of greater specialization by providing electives from nine options.

C. P. Lang has succeeded J. U. Ruef as assistant State club leader. D. H. Bailey has been appointed dairy manufacturing specialist vice G. A. Taylor, now a farm manager.

Death of Dr. A. C. True.—Dr. A. C. True, specialist in agricultural instruction in the Office of Cooperative Extension Work of the U. S. Department of Agriculture and widely known as an outstanding leader in agricultural education and research during his 40 years of service with the Department, died April 23 following a major surgical operation. He was in his seventy-sixth year. An editorial discussion of his life and work will appear in an early issue of the *Record*.

University of the Philippines.—The board of regents has established the Baker Memorial Professorship in the College of Agriculture in memory of the late Charles Fuller Baker, dean of that college from 1917 until his death in 1927. This professorship provides for the services in the college of a man from abroad who will be in residence at least eight months and will carry a teaching load of five hours per week. It is the purpose to secure men who are specialists in different sciences allied to agriculture.

Agricultural and Veterinary College of Minas Geraes, Brazil.—This institution held its first commencement December 15, 1928, granting certificates to 2 students from the one-year course. The total enrollment of the college in all courses is 70.

At the close of the year the State of Minas Geraes established a new position of technical advisor in agriculture, to which Dr. P. H. Rolfs, head of the college for the past eight years, has been appointed. Dr. Rolfs is to continue his residence at the college, but will have general supervision of all agricultural activities of the State Government. Dr. Bello Lisbôa, chief engineer for six years in charge of the construction work of the college and for two years vice director, has succeeded Dr. Rolfs as director.

The State of Minas Geraes is greatly enlarging its agricultural activities in other directions. A bureau, principally for the protection of livestock against diseases, has been established at Bello Horizonte with Dr. Hermann Rehaag as chief, and the State is preparing to organize a citrus station of 40,000 trees and conduct a modern exporting plant for citrus fruit. A biological institute corresponding to an experiment station is also to be established at the college, with the principal members of the staff recruited from abroad.

Hannah Dairy Research Institute, Scotland.—This institute has recently been established to deal with problems of the milk industry, especially milk production, physiology of milk secretion, the quality of milk, and the disposal of milk and its products.

The establishment of a dairy research institute for Scotland has been under consideration for some time. During the past year a gift by J. M. Hannah of the estate of Auchincruive in Ayrshire for the joint purposes of enabling the dairy school and other departments of the West of Scotland Agricultural College to move from Kilmarnock to a more suitable site and of providing accommodation for the proposed institute has enabled the plan to go forward. Pending the erection of the necessary buildings, the institute has its temporary headquarters in the Physiological Institute of the University of Glasgow.

The institute has been constituted the national institute for dairying in Scotland, and the greater part of its cost of maintenance is accordingly borne from the Development Fund. It is administered by a joint committee of management, consisting of representatives of the University of Glasgow, the West of Scotland Agricultural College, and the Department of Agriculture for Scotland, with Sir Donald MacAlister as chairman. E. P. Cathcart has been appointed interim director, and Dr. Norman C. Wright, who has held a

Commonwealth Fund Fellowship in the United States for the past two years, has been appointed physiologist.

Imperial Bureau of Animal Genetics.—This bureau has recently been established with headquarters at the University of Edinburgh and with Dr. F. A. E. Crew as director. The primary aim is to provide a central clearing house, bureau, and publishing organization for animal genetics. Particular attention is to be given to domestic animals and the interests of the British Empire, but it is hoped to serve the pure science of genetics as well.

Stellenbosch-Elsenburg College of Agriculture.—This college, formed by the amalgamation in October, 1926. of the Faculty of Agriculture of the University of Stellenbosch and the Elsenburg School of Agriculture, is now in full operation as a part of the University of Stellenbosch, Union of South Africa. About 150 candidates for the degree of bachelor of science in agriculture or home economics were registered in 1928, together with a considerable number for shorter periods. Graduate degrees of master and doctor of science in agriculture are also conferred.

The principal courses for the bachelor's degree are in agricultural chemistry, agricultural economics, agricultural engineering, animal husbandry, dairy husbandry, entomology, field husbandry, genetics, home economics, plant pathology, physical chemistry, pomology, statistical methods, veterinary science, and viticulture. The faculty numbers about 35, of whom 9 hold degrees from institutions in the United States and Canada.

An experimental milling and baking plant has recently been completed at Stellenbosch and various small buildings at Elsenburg and the cereal experiment station at Langgewens, Malmesbury. At the latter point approximately 50 morgens (108.5 acres) of arable land have been set aside for crop experiments, and considerable work is under way in variety, rotation, cultural, and fertilizer tests, as well as sheep breeding and management. T. G. W. Reinecke is director of experiment stations and senior extension officer.

Australian Commonwealth Council for Scientific and Industrial Research.—The first building to be completed for this council was officially opened by the Prime Minister of Australia on October 22, 1927. This is a laboratory building for the division of animal nutrition, located on the grounds of the University of Adelaide. A two-story building has been erected, costing approximately £14,000, and equipment has been installed for fundamental biochemical studies of animal nutrition, especially with sheep.

In addition to the work at the university, field studies with sheep are in progress at the Waite Institute and at four field stations, (1) 200 miles north of Port Augusta, South Australia, (2) near Beaufort, Victoria, (3) at Moree, New South Wales, and (4) quite recently at Springsure, central Queensland.

Frasch Foundation Awards for Research in Agricultural Chemistry.—The initial awards under the Elizabeth Blee Frasch Fund for research in the field of agricultural chemistry (E. S. R., 58, p. 601) have recently been announced. In accordance with the terms of the trust, these awards are made on a five-year basis. During the first period the Boyce Thompson Institute for Plant Research is to receive $20,000 per annum for research on two projects entitled, respectively, Effect of Stimulative Chemicals upon Plant Growth and Metabolism and Insecticide and Fungicide Investigations. The University of Missouri will receive $12,000 per annum for the support of investigations under an existing project entitled The Efficiency of the Animal Growth Process at Various Ages and under Various Conditions of Management, and the University of Wisconsin will receive $8,000 annually for the support of investigations dealing with the biochemistry of microorganisms as a subdivision of its project entitled Fermentation Studies.

The award was based upon recommendations submitted by a committee appointed by the American Chemical Society and consisting of President R. W. Thatcher and Drs. W. D. Bigelow, C. A. Browne, John Johnston, and C. R. Moulton. Under the policy recommended by the committee and adopted by the society, each five-year period is to be regarded as a complete unit with the expectation that work done under an allotment will be brought to completion at the end of the period. The funds supplied are to be used chiefly for the payment of salaries or other personnel services, the institutions bearing the cost of physical plant and equipment. Annual reports are to be required, and plans are being considered for a special publication series of monographs.

The terms of the grants have been accepted by the institutions and the initial payments made. President Thatcher has been designated as "a thoroughly competent expert who would supervise and report upon the use by these three recipients of the allotments made to them respectively."

Agricultural Survey by American Engineering Council.—A comprehensive nationwide study of agriculture, similar to the survey made by the Committee on Waste in Industry is being organized by the American Engineering Council. The American Society of Agricultural Engineers is expected to cooperate in this survey and is making definite provision for it in its program of future activities. An analysis of the agricultural situation will be made with a view to point the way "to practical and measurable standards of agricultural management; to an understanding of the interrelation and interdependence of agriculture, commerce, and industry; to better agricultural financing and credits; to improved marketing facilities and results; to lower unit costs of production; to the elimination of avoidable waste in farm activities and products; to improved rural conditions through greater use of power and mechanical equipment; and to larger net returns and high standards of living for those engaged in the agricultural industry."

It is expected that five years will be required to carry the project to completion.

Fourth World Poultry Congress.—This congress is to be held at the Crystal Palace, London, from July 22 to 30, 1930, followed by a series of tours covering the British Isles. The Ministers of Agriculture for England and Wales and Northern Ireland and the Secretary of State for Scotland will serve as presidents of the congress, with F. C. Elford of Canada, the president of the International Association of Poultry Instructors and Investigators, as first vice president, P. A. Francis as director of the congress, and Dr. V. E. Wilkins of the British Ministry of Agriculture as secretary.

Changes in Publications.—In accordance with a change in policy as regards the *International Review of Agriculture*, whereby isolated abstracts and similar items supplying technical, economic, or legislative information will be replaced so far as possible by comprehensive studies affording a general review of the actual situation in questions of international importance, the *Review* is henceforth to be issued in three parts. The first of these is *Monthly Bulletin of Agricultural Science and Practice*, the second *Monthly Bulletin of Agricultural Economics and Sociology*, and the third *Monthly Crop Report and Agricultural Statistics*. The initial number of the *Monthly Bulletin of Agricultural Science and Practice* under this plan consists mainly of summary articles on Subterranean Irrigation—Recent Progress; Notes on Olive Growing in Spain; Feeding of Calves and Young Pigs with "Corn Sugar for Calves;" The Present Position of the Cane Sugar Problem; and Certain Problems Connected with Modern Tendencies in Forestry Practice. Selected bibliographies accompany most of these articles.

A letter recently received from Henry I. Baldwin, American Representative of *Svenska Skogsvårdsföreningens Tidskrift*, calls attention to the fact that the change in policy outlined in these columns (E. S. R., 60, p. 500) became effective with the volume for 1927. Accordingly its international aspect has already become well established.

New Journals.—*Agrar-Probleme* is being published quarterly in the German language by the International Agricultural Institute of Moscow. In addition to a number of shorter articles, an account of the institute and its work, abstracts, reviews, etc., the initial number contains the following major articles: The Modern Agricultural Problem and Its Investigation, by S. Dubrowsky (pp. 1–31); Agricultural Organization under the Capitalistic Order (pp. 31–48) and The Interrelations of the Consuming and Agricultural Groups (pp. 49–58), both by N. Meschtscherjakow; Agrarian Reform in Middle Asia, I, by J. Wermenitschew (pp. 58–82); The Agrarian Problem in Austria, I, by W. Schiff (pp. 82–109); and The Latest Stage of the Peasant Movement in China, by B. Freier (pp. 110–148).

Cahier International des Associations Agricoles is being issued monthly by the Permanent International Commission of Agricultural Associations at the International Institute of Agriculture at Rome. The aim is to acquaint the 210 constituent associations with the progress of agricultural associations in the various countries. The initial number is devoted largely to a report of the work of the commission and of the Ninth General Assembly of the International Institute of Agriculture.

Forstliche Rundschau, a review of the literature on forestry, is being published quarterly by J. Neumann at Neudamm and Berlin, S. W. 11, Anhaltstrasse 7. The initial number contains nearly 600 abstracts arranged by countries. The number of countries represented is 8, but about 500 abstracts are from German sources. Ten abstracts are from North America, the section for which is in charge of A. B. Recknagel of Cornell University.

Journal of Adult Education is being published quarterly by the American Association for Adult Education at 41 East Forty-second Street, New York City. Among the associate editors is Dr. Kenyon L. Butterfield, formerly president of the Rhode Island, Massachusetts, and Michigan Colleges.

Quarterly Journal is being issued by the Rubber Research Institute of Malaya at Kuala Lumpur, Federated Malay States. The initial number consists largely of notes on the development and work of the institute, with 13 original articles on rubber culture and its problems.

Soil Research is being issued by the International Society of Soil Science, with Dr. F. Schucht, Invalidenstrasse 42, Berlin, N. 4, as editor. The first two numbers of volume 1 are supplements to the proceedings of the society.

Miscellaneous.—Dr. W. T. H. Williamson, senior assistant lecturer in agricultural chemistry at the Edinburgh and East of Scotland College of Agriculture, has been appointed director of the chemical section of the Egyptian Ministry of Agriculture vice W. S. Gray, who died August 31, 1928, at the age of 54 years.

Dr. H. J. Page, chief chemist of the Rothamsted Experimental Station, has accepted an appointment as head of research laboratories and chief chemist of Nitram, Ltd.

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EXPERIMENT STATION RECORD

VOL. 60 JUNE ABSTRACT NUMBER No. 9

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Nature of watery whites in eggs, J. L. ST. JOHN and E. L. GREEN (*Washington Col. Sta. Bul. 229 (1928), p. 21*).—Previous report has been made upon a part of this work (E. S. R., 59, p. 11). It is now reported that eggs in storage three months or more contained very little more ammonia nitrogen than did normal fresh eggs, but eggs showing watery white had in general less than one-third the ammonia nitrogen content of normal fresh eggs.

The results are taken as tending to confirm the conclusion previously suggested that the difference between watery and firm fresh eggs is of a character different from that of the difference between fresh and storage eggs.

METEOROLOGY

The climate of Florida, A. J. MITCHELL and M. R. ENSIGN (*Florida Sta. Bul. 200 (1928), pp. 91–300, figs. 14*).—This bulletin gives temperature and rainfall records with other pertinent information from 45 official weather stations located at various places in Florida.

"The average seasonal temperatures for the State are: Summer 80.8, autumn 72.5, winter 59.5, and spring 70.4. Maxima of 100° are by no means general during the summer; in fact, there have been months without such record. . . . July and August are the warmest months with an average of about 81°; thereafter, a rapid decline to 59° in December and January is noted. There is a difference of only 3° between spring and autumn."

"No portion of Florida is immune from frost under favorable conditions of atmospheric pressure and sky, save the islands of the southern coast. . . . Recent cold waves that were disastrous to citrus fruits, and largely so to groves, occurred during December, 1894, and February, 1895 and 1899; those of January, 1886, and February, 1917, were but little less severe. A minimum temperature of 2° below zero at Tallahassee on February 13, 1899, is the Florida record for a century. . . .

"The average seasonal rainfall . . . is: Winter 3 in. per month, autumn 4.39, summer 6.94, and spring 3.12 in. The lean years show, in many instances, more than 50 per cent less rainfall, when compared with the years of maximum precipitation. The driest month, as a rule, is November with an average of 2.25 in.; the wettest, July, with an average of 7.22 in. All districts of the State have received annual amounts in excess of 80 in., the marked excesses being more frequent in coastal districts than in the interior, although, in the absence of physical contrasts, the differences are of little moment."

"Cyclonic rains occur most frequently from November to March, inclusive, as centers of extratropical storms move east-northeastward over continental districts. October, also, contributes to the cyclonic rainfall, especially on the lower east coast of the peninsula. While Florida is so situated geographically as to justify the expectation of generous rainfall, the State is not entirely immune from drought—never so severe, however, as to seriously imperil crops. There are, however, well-defined dry and wet periods. The period of major precipitation begins, as a rule, with June and ends with September, except that the average rainfall during October on the southeast coast equals that of September—due to the influence of tropical disturbances whose average track during October is sufficiently near the Atlantic coast line of Florida to greatly augment the rainfall for that month. . . . High winds may be expected, particularly on the coast, during the late summer and early autumn, as tropical disturbances move northward, but such storms are by no means of annual occurrence. . . . The prevailing winds during the spring are from the southeast; summer, from the southwest; autumn and winter, from the northeast."

A foreword by C. F. Marvin and W. Newell explains the cooperation of the Weather Bureau and the experiment station in the preparation of the bulletin.

Meteorological observations, 1926–27 (*Guam Sta. Rpt. 1927, p. 17*).—A condensed summary of observations on temperature, precipitation, and wind at the station during each month of the year ended June 30, 1927, is given. The total rainfall (84 in.) was somewhat less than that of 1926, but was more evenly distributed, and there was no pronounced drought.

The climatology of the Gold Coast, N. P. CHAMNEY (*Gold Coast Dept. Agr. Bul. 15 (1928), pp. 63, pls. 12*).—This report summarizes and discusses the available data with regard to physiography and climate, temperature, moisture, air pressure and velocity, and the relation of meteorology to agriculture. It also includes an account of the harmattan season, characterized by "a lowering of humidity, hot days with cold nights, and dusty haze caused by the red dust of the Sahara Desert being carried and deposited over the Colony," and the results of a study of the causes of progressive variations ("tiring") of thermometers.

SOILS—FERTILIZERS

Soil survey of Rutherford County, North Carolina, R. C. JURNEY ET AL. (*U. S. Dept. Agr., Adv. Sheets Field Oper. Bur. Soils, 1924, pp. III+125–154, fig. 1, map 1*).—Rutherford County comprises 366,720 acres of predominantly rolling land in the southwestern part of the State. The smoother lying portions are well drained for the most part, though erosion is active and terracing necessary on the hills and steeper slopes.

Cecil clay loam leads the 8 series of 15 types in areal extent, covering 37.1 per cent of the tract surveyed. Cecil sandy clay loam follows with 16.5 per cent, and Porters stony loam with 12 per cent. The unclassified areas are meadow 1.7, rough stony land 4.1, and rock outcrop 0.6 per cent.

This survey was made in cooperation with the North Carolina Department of Agriculture and the North Carolina Experiment Station.

The temperature of cultivated soil at Giza, W. S. GRAY and A. A. NASSAR (*Egypt Min. Agr., Tech. and Sci. Serv. Bul. 79 (1928), pp. [2]+12, pls. 17*).—Results of observations extending over several years on the temperature of fallow land at the surface and at depths of 5, 10, 15, 20, 25, and 30 cm. and on cropped soils at the surface and at depths of 5, 10, 20, 30, and 50 cm. are presented in text, tables, and diagrams. The cropping consisted of a rotation of cotton, wheat, maize, and berseem. The range of temperature decreased with depth. The mean range under wheat at depths of 5, 10, and 20 cm. narrowed during vegetative growth until the period of full ear, then steadily widened until maturity. The maximum temperature at all depths was higher under berseem than under wheat. The general effect of the crops was to lower soil temperature, and at a depth of 25 cm. the temperature during the fallow period after a crop did not rise as high as in the case of continuous fallow.

Influence of soil relief on fertility [trans. title], N. N. KOURTIAKOFF (*Compt. Rend. Acad. Sci. [Paris], 188 (1929), No. 2, pp. 189–191; abs. in Rev. Sci. [Paris], 67 (1929), No. 3, p. 93*).—Examination of infertile depressions in a field showed reduction of yield to be associated with a lowering of the level of carbonates in the soil.

Soil organic matter maintenance, I. M. INGHAM and H. M. WANSER (*Washington Col. Sta. Bul. 229 (1928), p. 47*).—Apparent cumulative effects following the third crop are noted. Removal of all residues has apparently lowered the yield slightly, whereas the yields from the plats receiving residues or fertilizers were a little higher than those from the check plats.

The effect of legumes, both immediate and accumulative, expressed in terms of yields of trial crops, M. NELSON (*Arkansas Sta. Bul. 231 (1928), pp. 20, 21*).—Cowpeas, soy beans, velvet beans, and Hubam clover, each plowed under, gave the respective increases in corn yield of more than 22 bu. per acre, 20.4 bu., 11.25 bu., and 4.27 bu. Cowpeas following a crop of oats in the same season and plowed under gave an increase of over 13 bu. per acre, and soy beans in like manner 7 bu. Other yields illustrative of similar effects are stated.

Lime, phosphate, and potassium were supplied in this test, but nitrogen was provided only in the form of the crops plowed under. Organic matter was added only in the form of the legumes plowed under and by the return of the cornstalks to the soil.

Effect of irrigation on reaction of rice soils, R. P. BARTHOLOMEW (*Arkansas Sta. Bul. 231 (1928), p. 32*).—Phosphatic fertilizers were found of little value on rice soils, the explanation suggested being the use of lime-bearing irrigation water from wells drilled in limestone. This irrigation water showed a reaction of about pH 7.5, and the reduction by it of the H-ion concentration of the soil was indicated.

The effect of cultivation on nitrate production and the retention of moisture in soils, R. P. BARTHOLOMEW and W. H. METZGER (*Arkansas Sta. Bul. 231 (1928), pp. 32, 33*).—Weeds were found to have taken up a large proportion both of the nitrogen present as nitrate and of the soil moisture supply on the uncultivated plats. Rye and vetch both proved very effective cover crops for preventing loss of nitrogen as soluble compounds during the winter months.

Rice nutrition, R. P. BARTHOLOMEW (*Arkansas Sta. Bul. 231 (1928), pp. 31, 32*).—Losses of nitrogen due to denitrification followed irrigation, whatever the form of the nitrogen as applied, but losses from ammonium compounds were slightly less than from other forms of nitrogen. With the exception of calcium nitrate, all forms of nitrogen appeared equally available to rice. It was considered best to use ammonium compounds, however, because their effect on the soil reaction was found more desirable for rice growing than was that of the physiologically basic nitrogenous fertilizers.

Organic nitrogen in commercial fertilizers, M. NELSON (*Arkansas Sta. Bul. 231 (1928), pp. 23, 24*).—More than from 20 to 30 per cent of organic nitrogen as cottonseed meal could not advantageously be used in the tests with cotton, the remaining nitrogen being supplied in the forms of sodium nitrate, ammonium sulfate, and Leunasaltpeter. As advantages of the use of the largest proportion of cottonseed meal consistent with maximum yields are noted an improvement in the physical condition of the fertilizer mixture and economy when the price of cottonseed is such as to yield this advantage.

The rôle of potassium in plant nutrition, R. P. Bartholomew and G. Janssen (*Arkansas Sta. Bul. 231 (1928), p. 33*).—In culture solutions alfalfa and sweet clover required only from 0.5 to 1.0 part per million of potassium for maximum growth, whereas soy beans, cowpeas, Sudan grass, and cotton required the maintenance of from 3 to 5 parts per million for maximum growth. The latter crops made good growth, however, at but 0.5 part per million of potassium.

Relation of the water-soluble potash, the replaceable, and acid-soluble potash to the potash removed by crops in pot experiments, G. S. Fraps (*Texas Sta. Bul. 391 (1929), pp. 18*).—Water-soluble potassium was studied in its relation to potassium removed by crops, to active potassium, and to the effect of cropping; potassium soluble in 12 per cent hydrochloric acid in its relation to potassium removed by crops; replaceable soil potassium in its relation to potassium removed by crops; etc. Correlation coefficients were determined for these and other relations. The conclusions are as follows:

The water-soluble potassium in the soil, the potassium soluble in 12 per cent hydrochloric acid, and the replaceable potassium in the soil are all related to the potassium removed by crops in pot experiments and to the active potassium of the soils. The water-soluble potassium lost from the soil by cropping and the replaceable potassium lost by cropping are related to the amount of potassium taken up by the crop grown on the soils and to the active potassium lost by cropping. The amount of potassium taken up by two crops usually averages 5 to 6 times the water-soluble potassium in the soil and about one-half the replaceable potassium in the soil. The amount of potassium removed by the crops from the soil is usually 8 to 16 times the water-soluble potassium lost in cropping and about twice the replaceable potassium lost in cropping. The loss of replaceable potassium in cropping is greater than the loss of active potassium by cropping.

The difference in the amounts of potassium removed by a first and second extraction of soils with 0.2 nitric acid becomes greater as the potassium taken up by the crops in the pot experiments increases. When a soil neutralizes 85 per cent or less of the acid used, the interpretations of the results are more closely in accordance with the results of the pot experiments when the correction is not made for the neutralization of the acid than when it is made. When the soils neutralize more than 85 per cent of the acid, the interpretation of the results varies from the actual results a little less when correction is made for acid consumed than when it is not, but in both cases the deviation is more than for less basic soils. It appears better not to correct for neutralization but to take the highly calcareous nature of the soil into consideration in making the interpretation of the results.

Calcium content of plants and its relation to their ability to feed upon rock phosphate, R. P. Bartholomew (*Arkansas Sta. Bul. 231 (1928), p. 33*).—As the result of analyses of various plants, no relation was found to exist between the calcium content of the plant and its ability to utilize rock phosphate.

Sources of material used as fertilizers and soil amendments, M. Nelson (*Arkansas Sta. Bul. 231 (1928), p. 24*).—Ground limestone and ground chalk used alone showed no superiority over other forms of lime, but when used in conjunction with a complete fertilizer the chalk and limestone appeared more effective than other forms.

In a corn, wheat, and clover rotation, cottonseed meal gave somewhat higher returns than did manure or sodium nitrate. In combination with lime, phosphorus, and potassium, however, sodium nitrate and manure produced the better yields. Applied alone, bone meal gave better yields of oats, but in combination with manure, basic slag and bone meal brought about the higher yields.

Varying ratios in commercial fertilizers, M. Nelson (*Arkansas Sta. Bul. 231 (1928), pp. 26, 27*).—At Marianna the formulas 8–4–4, 10–4–4, and 12–4–4 were found preferable for cotton, while at Scott the same formulas together with 8–6–4 and 8–4–2 seemed desirable, marked departure from such ratios having been attended by very much lower returns. Varying the nitrogen from 0 to 6 per cent showed very definite response, the optimum ranging between 4 and 5 per cent, while varying the potash and phosphorus showed less definite response.

Rates of application of commercial fertilizers, M. Nelson (*Arkansas Sta. Bul. 231 (1928), p. 26*).—The following returns per dollar invested in 10–4–4 fertilizer for cotton were obtained: From 200 lbs. per acre a profit of $2.12 per dollar spent; from 400 lbs. a profit of 98 cts.; from 600 lbs. 41 cts.; from 800 lbs. 3 cts.; from 1,000 lbs. 47 cts.: from 1 200 lbs. a loss of 21 cts.; from 1,400 lbs. a gain of 5 cts.; and from 1,600 lbs. a loss of 6.5 cts.

It is concluded that profits from applications of over 600 lbs. per acre will be small or doubtful, but it is noted that the results can not be applied to all soils in the State.

AGRICULTURAL BOTANY

Plant nutrition.—I, Exchange of water and of mineral substances, M. Molliard (*Nutrition de la Plante.—I, Échanges d'Eau et de Substances Minérales. Paris: Octave Doin, 1927, 2. ed., rev., pp. XIII+393, figs. 46*).—This is No. 1 of the catalogue previously noted (E. S. R., 54, p. 427).

Nutrition, vitamins, and disease resistance [trans. title], P. Mazé (*Ann. Inst. Pasteur, 41 (1927), No. 9, pp. 948–981*).—In the present article, which deals with the mineral nutrition of the living cell in connection with vitamins and also with mineral nutrition and the natural resistance of plants and animals to transmissible diseases, the author states that in his studies, some of which have been noted (E. S. R., 34, p. 627; 38, p. 48), he has encountered numerous facts, mostly in the mineral nutrition of maize, presenting analogies to certain facts put forward by authors named in support of views involving accessory factors of alimentation, or vitamins. The claim is made that vitamins tend to appear as if blended, mixed, or identified with mineral foods. Immunity depends upon the actual chemical capabilities of the organism. The modes of expressing effectively these capabilities are discussed.

Similarity between physicochemical and biological reactions, C. P. Sideris (*Plant Physiol., 3 (1928), No. 1, pp. 79–83*).—In a study attempting to compare biological with physicochemical reactions and to interpret the former in terms of the latter, it was found that *Fusarium martii*, *Verticillium* sp., and *Penicillium* sp. do not grow in isoelectric pineapple stem protein A. Fusarium may grow in solutions in this protein having a pH value above that of the isoelectric point of the protein. Verticillium behaves in exactly the reverse manner, growing only in solutions of the protein having pH values below that of the isoelectric point. *Penicillium* sp. was found to grow in solutions of the protein having a pH value either above or below the isoelectric point.

Acidification of unbuffered salt solutions by plant tissue in relation to the question of tissue isoelectric points, F. E. Denny and W. J. Youden (*Amer. Jour. Bot., 14 (1927), No. 7, pp. 395–414, figs. 5*).—A previous paper has been noted (E. S. R., 58, p. 122), dealing with experimentation relating to the question whether plant tissue, in its effect upon the pH of the surrounding solution, acts as though it had an isoelectric point or shows a behavior analogous to that of a protein. That paper reported the effects of tissues upon the pH of buffer solutions (phosphate, phthalate, and borate). The present paper reports experimentation in which unbuffered salt solutions (KCl, $CaCl_2$, and others) were used.

It is stated that previous reports to the effect that plant tissue in different salt solutions of different concentrations bring the external pH to definite values characteristic of each tissue were not confirmed. In the authors' experiments the external pH value varied with the salts used, with the concentration, and (particularly) with the nature of the cation. Only when the concentration of a salt was sufficiently reduced was a characteristic pH value for a given tissue approached, and this pH value was merely the pH of the water extract of the tissue obtained by bringing the tissue in contact with water instead of salt solution. The changes in H-ion concentration of the external solution (when any changes were obtained) were always in the direction of increased acidity. It is shown that this increase in H^+ is not to be interpreted as being the result of unequal absorption rate of cations and anions by the tissue.

It was further found that increases in H-ion concentration were obtained when salts were added to various organic acids (malic, oxalic, succinic, aspartic). When the organic acids were first adjusted to various pH values before the addition of $CaCl_2$, acidification effects were observed at all pH values from 2 to 7.5. Experiments in which $CaCl_2$ was added to protein solutions at various pH values and to that fraction of potato juice containing the protein tuberin showed that the behavior of proteins on the addition of salts was not analogous to that obtained on adding salts to the tissues. Cases were observed in which the total effect of the tissue could not be accounted for by the substances leaching out of the tissue and reacting with the salt solution.

It is held that although the results do not show that the tissue itself or the proteins take no part whatever in these changes in pH, they indicate that the soluble, nonprotein, noncolloidal substances which diffuse out of the tissue into salt solution and which then react with it are important factors in the acidifications that are produced in the external solution.

"The observed changes in H-ion concentration, therefore, can not be interpreted as indicating an isoelectric point for the tissue as a whole, nor furnish proof that reaction has occurred between the ions of the salt solution and proteins with characteristic isoelectric points."

Effect of light, carbon dioxide, and temperature on flower and fruit production, J. M. Arthur and J. D. Guthrie (*Mem. Hort. Soc. New York, 3 (1927), pp. 73, 74, pls. 2*).—The plants for the two series of experiments reported, employing a temperature of 26° for 1925 and 20° C. for 1926, were grown each under four conditions, (1) ordinary greenhouse conditions during March, April, and May, but with temperature and humidity controlled; (2) a similar greenhouse with 6 hours' additional illumination (12 midnight to 6 a. m., from a gantry crane carrying 48 1,000-watt gas-filled lamps); (3) same illumination as in (2), except 6 p. m. to midnight, with additional carbon dioxide (as near 0.3 per cent as was found practicable); and (4) constant light room, artificial illumination only, 25 1,500-watt gas-filled lamps and 4 mercury vapor tubes, temperature and humidity controlled, and carbon dioxide concentration increased.

Grains, such as oats, spring wheat, and barley, grew and yielded well even at a relatively high temperature (26°) if given additional light and carbon dioxide. With additional light only, the plants grew lower and made fewer heads. Plants of (2) and (3) flowered and fruited much earlier than did the controls. With additional light and carbon dioxide, barley grows and yields well even at high temperature and with abundant nitrogen supply. Potato is definitely limited to a low temperature and does not utilize additional light and carbon dioxide at high temperatures.

As reported by Garner and Allard (E. S. R., 42, p. 818), length of day was found to have a marked effect on the flowering and fruiting of several plants, regarding which particulars are given.

Sweet peas, petunia, and snapdragon flowered profusely on a 24-hour artificial day in the constant light room. In general, this flowering was not greatly affected by temperature changes between 20 and 26°, but sweet peas grew and flowered most luxuriantly at the lower temperature.

Red clover was grown from seed to flower in 38 days in 2 greenhouses and in the constant light room on 18- and 24-hour days, respectively. Additional concentrations of carbon dioxide increased both the height of the plants and the amount of flowering.

The effect of accumulated carbon dioxide on plant respiration, J. J. WILLAMAN and J. H. BEAUMONT (*Plant Physiol., 3 (1928), No. 1, pp. 45–59, figs. 6*).—Because of certain mechanical difficulties apparently inherent in the method involving continuous aspiration which was employed in the first series, as previously reported (E. S. R., 53, p. 143), discontinuous aspiration was tried, and this gave an entirely different picture of respiratory activity. A more detailed study of the phenomenon was undertaken, the results of which are here presented.

The respiration of apple twigs at 0° C., of potato tubers at or near 22°, and of wheat grain at 40° was studied as to the effect of allowing the carbon dioxide to accumulate in the respiration chamber. It was found that the CO_2 production rate decreases continuously with time, in ways which are described for two distinct periods, with presentation of proposed alternative explanations.

The conclusion is emphasized that the investigator should take account of the CO_2 effect in deciding which procedure, the continuous or the discontinuous, to adopt for the work in hand. Under some circumstances, as in a study of grain and fruit in storage, more useful knowledge might be secured by the accumulation method.

The influence of eosin on root growth [trans. title], F. BOAS (*Ber. Deut. Bot. Gesell., 45 (1927), No. 1, pp. 61–64, figs. 3*).—Abnormalities as to direction of root growth following 17 hours in 1:1,000 or in 1:100,000 eosin are indicated.

Action of prussic acid on the growth of fungi [trans. title], C. SIBILIA (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser., 7 (1927), No. 2, pp. 202–212, figs. 2*).—Concentrations of from 0.33 to 2.5 gm. per cubic meter of hydrocyanic acid failed to kill, or to check except temporarily as to growth, the mycelium of the fungi *Alternaria tenuis*, *Gloeosporium cyclaminis*, *Pachybasium amatum*, *Mastigosporium lupini*, *Fusarium* sp., *F. subulatum*, *Penicillium glaucum*, *Mucor mucedo*, *Cladosporium herbarum*, *Dematophora necatrix*, and *Phytophthora infestans*. The effects noted were thought to have been due in great part to the action of the poison absorbed or adsorbed by the substratum supporting the mycelium. Direct action of the prussic acid on the fungi was not observed, and it is thought that such action does not occur at the concentrations used. The fungi are not injured by such concentrations under conditions natural to them. Spores of *Mastigosporium lupini* were killed after remaining for one hour in a concentration of prussic acid as high as 2.5 gm. per cubic meter.

Photosynthesis in absence of oxygen, E. N. HARVEY (*Plant Physiol., 3 (1928), No. 1, pp. 85–89*).—It is stated that 14 species of marine algae, representing the green, the red, and the brown group, proved to be able to produce oxygen from carbon dioxide when illuminated in complete absence of oxygen.

The oxygen appears within a second after the light is admitted, this fact evidencing the ready permeability, to this gas, of the plasma and the cellulose membrane. Luminous bacteria are said to be suitable in testing for oxygen under all conditions which these bacteria can survive.

Pigment of Microcera coccophila [trans. title], A. PULSELLI (*Biol. R. Staz. Patol. Veg.* [*Rome*], *n. ser., 7* (*1927*), *No. 4, pp. 436–447, fig. 1*).—A study is outlined of the formation and nature of the pigment of *M. coccophila* and of the relation of pigmentation to light.

The development of chlorophyll in seedlings in different ranges of wave lengths of light, J. D. SAYRE (*Plant Physiol., 3* (*1928*), *No. 1, pp. 71–77, figs. 3*).—It is claimed that radiant energy of wave lengths greater than 680 $\mu\mu$ is not effective in connection with chlorophyll formation in seedlings of corn, wheat, oats, barley, bean, sunflower, and radish, though the range of effectiveness as regards chlorophyll formation extends as far as wave length 300 $\mu\mu$ if the energy value is sufficient. For a given energy value, greater effectiveness obtains in the green than in the blue region, and still greater in the red, the effectiveness increasing to an abrupt end about wave length 680 $\mu\mu$.

Growth studies.—VI, On the relative sizes of growing plant organs, W. H. PEARSALL (*Ann. Bot.* [*London*], *41* (*1927*), *No. 163, pp. 549–556, figs. 3*).—A further analysis of data published in the fifth paper of this series (E. S. R., 58, p. 725), as bearing upon the correlation between the growth of the stem and that of the root, is said to have shown that a single relation exists between the stem weight and the root weight during the growth periods of these organs.

"The relative sizes of plant organs are shown to conform to the equation $x=cy^k$, where x and y are the sizes of the organs, c is a constant expressing their relative initial sizes, and k is a quantity expressing the ratio of their relative logarithmic growth rates and the spatial arrangements of their meristems."

Dormancy in hybrid seeds, W. CROCKER (*Mem. Hort. Soc. New York, 3* (*1927*), *pp. 33–38, fig. 1*).—This account, intended to emphasize mainly the germination of hybrid seeds of Rosaceae of the colder north temperate zone, states that of the three subfamilies (Pomeae, Roseae, and Pruneae) studied in some detail, every genus dealt with showed the need of an afterripening period in germinative conditions at a low temperature. The old practice of stratifying certain seeds at a low temperature in moist condition preparatory to planting, which furnished this condition in a general way, often failed in practice, in part because it was not realized that the process of afterripening in these seed had a rather definite temperature optimum. The work here discussed established the existence of such temperature optima and showed that the optima may vary somewhat with species, but that it is usually near 5° C. In some cases the optima are very distinct or involve a narrow range of temperature, while other cases show wider ranges. It is shown also that various genera and species of several other plant families respond to low temperature stratification as do the rosaceous seeds. Figures and tabulations support these also less general statements.

It is emphasized that hybridizers of rosaceous forms may profit by making use of low temperature stratification in the production of their hybrid seedlings.

Problems of vegetative propagation, J. H. PRIESTLEY (*Jour. Roy. Hort. Soc., 51* (*1926*), *No. 1, pp. 1–16, pls. 12*).—Claiming to attempt only a restatement of the problem of vegetative propagation in terms of the fundamental processes of growth and development, with tentative suggestions as to the justification of current practices, the author deals with two main topics, (1) the normal growth of the plant and (2) vegetative propagation in terms of growth, particularizing in the second on the distribution of meristematic cells throughout the plant, roots from the vascular cambium, the food supply to new roots, shoots from the phellogen or cork cambium, the origin of new meristematic cells, and polarity.

Abscission in general and with special reference to the curtailment of fruitage in Gossypium, F. E. Lloyd (*Mem. Hort. Soc. New York, 3 (1927), pp. 195–207, pl. 1*).—Abscission, here defined as a mode of activity of living cells whereby they separate from the tissues in which they occur, is chiefly of two types. In the first, separation of cells in place occurs by chemical alteration of the middle lamella and adjacent secondary walls. In the second, separation of the cells is produced by renewed meristematic activity and following chemical changes in the walls of the same kind. At the completion of separation the loosened cells are normally alive and capable of high turgidity. Abscission may or may not be accompanied by lignifications. There is no immediate or necessary connection between these processes, although there is a sort of harmony of relation.

The energy expended by abscission cells requires an immediately available food supply, and a plethora of water is also necessary. Lack of photosynthates or of water can work only indirectly, and by way of inducing conditions which are stimulatory to abscission. Injury affects abscission in a similar way, except that both stimulatory and inhibitory influences have been detected. The fact that abscission is, in general, a response to some stimulus places it in the same category as that to which the abscission of petals has been referred by Fitting (E. S. R., 27, p. 230). Since the particular details of the mechanism are as yet lacking, it is regarded as doubtful whether there is any real distinction between the behavior of the petals studied by Fitting and other petals, as the corolla of Gossypium, or other organs.

Abscission in Gossypium is of the second type above noted. The various conditions known or supposed to lead to abscission of the buds, flowers, and fruit in the field as set forth include the destruction of pollen by rain, failure of anthers to open during low temperatures, injury, water stress, and mechanical strains due to disharmony of growth between pedicel and stem.

Water stress may be procured both directly and by the lack of photosynthates due to insufficient light. It is argued that the mechanical strains set up can have no direct effect on abscission, which is said to proceed in the same fashion whether or not such strains are present.

Clover-plants in sterile cultivation do not produce a bacteriophage of B. radicicola, A. Grijns (*Centbl. Bakt.* [*etc.*], *2. Abt., 71 (1927), No. 8–14, pp. 248–251, fig. 1*).—By rearing clover plants in the presence of a nonlysogenic strain of *Bacillus radicicola* under conditions otherwise completely sterile and then comparing the results with those in control plants which had been inoculated with the bacterium and with its bacteriophage, the author showed that, in conformity with results of experiments with animals as mentioned, the clover plant does not produce a bacteriophage, and that under such conditions as those here employed the presence or the absence of a bacteriophage does not affect the growth of the plant.

Variegated wild plants [trans. title], W. Rischkow (*Biol. Zentbl., 47 (1927), No. 1, pp. 18–25, figs. 7*).—The cases of variegated wild-growing plants briefly noted represent *Setaria glauca, Atriplex roseum*, and *Plantago major*.

Deciding factors in species distribution [trans. title], F. S. Bodenheimer (*Biol. Zentbl., 47 (1927), No. 1, pp. 25–44, figs. 3*).—A discussion, with examples, of the age and area theory of plant distribution, dealing largely with the views set forth by Willis (E. S. R., 51, p. 821).

GENETICS

Precepts and rules of Mendelian heredity, L. BLARINGHEM (*Principes et Formules de l'Hérédité Mendélienne. Paris: Gauthier-Villars & Co., 1928, pp. XIII+194+*[2], *figs. 5*).—The author discusses the inheritance of characters according to the present concept of Mendelism.

The cytological basis of heredity, K. BĚLAŘ (*Die Cytologischen Grundlagen der Vererbung. Berlin: Borntraeger Bros., 1928, pp. IV+412, pls. 2, figs. 280*).—An account of the histological structure of the cell and the behavior of the individual components during cell division and reproduction, with reference to the part played by each in heredity.

Inheritance in Primula sinensis, D. DE WINTON (*Jour. Roy. Hort. Soc., 54 (1929), No. 1, pp. 84–90*).—A discussion of the inheritance in *P. sinensis* of various characters, such as type of growth, type of flower, flower color, etc. The somatic number of chromosomes was found to be 24, with tetraploid forms occurring occasionally as mutations from the diploid. The tetraploids were normally completely self-sterile. A linkage was noted between green stigma color and dark claret colored leaves and stems, and was so nearly complete that only one plant with red stigmas and claret colored leaves was expected in 6,500 seedlings of the cross between green stigma, claret leaf plants and red stigma, green leaf plants.

An inheritance study of the distribution of vitamin A in maize, S. M. HAUGE and J. F. TROST (*Jour. Biol. Chem., 80 (1928), No. 1, pp. 107–114, fig. 1*).—The association between the vitamin A content and the inheritance of the yellow endosperm kernel character in a cross between Reid Yellow Dent and Johnson County White Dent corn was studied at the Indiana Experiment Station in cooperation with the U. S. Department of Agriculture.

Vitamin A was found to be transmitted exclusively with yellow endosperm in the process of crossing and segregation. No measurable transfer of vitamin A to white endosperm grains selected from the F_2 segregating ears was obtained. Since there is a close physiological association between vitamin A and yellow endosperm kernel character in dent corn, any genetic relationship must be one of close linkage between the two factors. At the level of corn used in the rations of albino rats in these experiments, the three classes possessing yellow endosperm, heterozygous F_2, homozygous F_2, and homozygous parent, were equally effective in preventing ophthalmia.

Species crosses in the genus Cucurbita, E. F. CASTETTER (*Iowa State Col. Jour. Sci., 2 (1928), No. 3, pp. 219–227*).—Studies at the Iowa State College upon the possibilities of pollination between the three species of Cucurbita, *C. pepo*, *C. maxima*, and *C. moschata*, indicated that although *C. pepo* and *C. maxima* could be intercrossed, the hybrid progeny in the F_1 was entirely self-sterile. Crosses between *C. pepo* and *C. moschata* gave rise to many seeds, both the F_1 and F_2 being quite fertile. C. moschata × C. pepo yielded no viable seeds. Although no difficulty was met in crossing *C. maxima* with *C. moschata*, the F_1 plants were uniformly self-sterile on account of abortive pollen. Parthenocarpy was observed to be quite common in these crosses, but in no instance was parthenogenesis observed.

Concerning the sterility of phanerogamic plants (French studies), D. BOIS, trans. by I. HEIN (*Mem. Hort. Soc. New York, 3 (1927), pp. 377–397*).—The author deals, at varying length, with a wide range of phanerogamic sterility.

Investigations concerning the causation of gametic sterility, G. TISCHLER, trans. by W. MARQUETTE (*Mem. Hort. Soc. New York, 3 (1927), pp. 9–13*).—The author summarizes work done and views arrived at during 1898–1925, chiefly by himself but also by 11 others, bearing upon questions connected with causes and causation of gametic sterility.

The origin of color in domestic animals [trans. title], E. Esskuchen (*Züchtungskunde, 2 (1927), No. 7, pp. 337–351, figs. 7*).—This paper deals with a histological study of the skin of fetal calves, describing the pigment formation at different stages of development.

The study of a specific vestigeal wing character in chickens, R. M. Smith (*Arkansas Sta. Bul. 231 (1928), pp. 41, 42*).—A study of the inheritance of a vestigeal wing character observed in a Columbian Plymouth Rock male in the F_2 and back-cross offspring indicated that the character was not a mutation since no vestigeal wing individuals were produced.

A readily detectable sign of ovulation in the monkey, C. G. Hartman (*Science, 68 (1928), No. 1767, pp. 452, 453*).—The author reports that ovulation in the monkey may be diagnosed by the presence of red cells which may be washed from the vagina. These cells are from the small amount of hemorrhage occurring when the follicle ruptures to release the ovum.

The vaginal smear method of assay of the ovarian hormone, L. C. Kahnt and E. A. Doisy (*Endocrinology, 12 (1928), No. 6, pp. 760–768*).—From a critical study of the vaginal smear method for determining the strength of extracts of the ovarian hormone, the author recommends the use of animals showing regular cycles before ovariotomy and the discarding of those individuals showing oestrous or prooestrus later than the second day after the operation. The animals used should be primed with 2 rat units and tested at weekly intervals with 1.3 rat units and 0.7 rat units, those animals negative to the former test or positive to the latter being discarded. The animals should not be used longer than 4 months. If 75 per cent of the individuals injected with the same volume give a + reaction, it should be considered that the tested fluid contained 1 rat unit of the ovarian hormone.

The distribution of the ovarian hormone between liquor folliculi and the residual tissue, S. Thayer and E. A. Doisy (*Endocrinology, 12 (1928), No. 6, pp. 769–772*).—Tests of the amount of ovarian hormone present in the liquor folliculi aspirated from ripe follicles of fresh ovaries and from the residual tissue showed that the former contained an average, in 10 experiments, of 933 rat units per kilogram as compared with 167 rat units per kilogram in the latter tissue.

Ovarian and placental hormone effects in normal, immature albino rats, G. T. Golding and F. T. Ramirez (*Endocrinology, 12 (1928), No. 6, pp. 804–812, figs. 4*).—Two litters of rats were injected twice daily with water-soluble preparations of ovarian hormone, beginning with 2 rat units at 12 and 18 days of age, respectively, and increasing the dose daily for from 20 to 36 days, the total doses ranging from 74 to 214 rat units.

A comparison of the injected animals with controls indicated that the heavy dosage of the ovarian hormone inhibited growth of the genital organs, and the testes remained in the abdomen in males. In females the vagina opened and vaginal smears showed continuous oestrum, though there were no corpora lutea in the ovaries. A few animals which were not killed showed a complete recovery in a short time after the injections were discontinued.

The influence of age at castration on the size of various organs, J. R. Baker (*Brit. Jour. Expt. Biol., 5 (1928), No. 3, pp. 187–194, figs. 3*).—The study of the effect of castrating male pigs at 50, 100, and 200 days on the development of the various sexual and endocrine organs indicated that castration before 100 days resulted in a reduction in the size of the vesiculae seminales, bulbo urethrals, and adrenals, as compared with castration at 200 days. Castration at 50 and 100 days gave about equal results. The thyroid, pineal, and pituitary glands and body weight were not affected by the time of castration.

The effect of the injection of alcohol into the male mouse upon the secondary sex ratio among the offspring, A. C. CHAUDHURI (*Brit. Jour. Expt. Biol., 5 (1928), No. 3, pp. 185, 186*).—The subcutaneous injection of 0.2 cc. doses of 20 per cent ethyl alcohol on alternate days into male mice caused a disturbance in the sex ratio among the offspring of the treated individuals. The percentage of males in the offspring produced by untreated parents was 41.54±2.16, while the percentage of males in the offspring from alcoholized males mated with untreated females was 56.13±1.64. This disturbance is considered to be the reflection of a selective effect of the alcohol upon the X-chromosome-bearing sperm.

FIELD CROPS

[Field crops experiments in Arkansas], C. K. McCLELLAND, G. JANSSEN, J. O. WARE, M. NELSON, J. R. COOPER, V. M. WATTS, and G. W. WARE (*Arkansas Sta. Bul. 231 (1928), pp. 10–21, 22, 23, 24–26, 27–30, 62, 63, 64, figs. 4*).—Continued experiments (E. S. R., 58, p. 321) reported on included variety trials with corn, grain sorghum, sorgo, oats, soy beans, cowpeas, and miscellaneous legumes; cultural tests with corn; interplanting of legumes in corn (E. S. R., 60, p. 36); breeding work with corn, cotton, and oats; and fertilizer tests with oats and corn.

Study of suckers in corn at the station and at Scott in 28 varieties over a period of years showed a varietal or heritable tendency toward sucker production, a marked seasonal variation, and place effect. Pride of Saline, Commercial White, Champion White Pearl, and Hasting Prolific tended toward maximum sucker production, while Surcropper, Goliad, and Southern Beauty were among those with the least. In general the suckering was higher at Scott. Size of seed, depth of planting, rate of planting, and quantity of available nitrogen also influenced sucker production. Removal of suckers in three different stages produced no effect with yields below 35 bu. per acre, but reduced yields when they were above 45 bu.

Corn showed an average loss from very shallow cultivation, small increases from deep cultivation, nearly total loss from no cultivation, and about normal yields at the station and Scott when the weeds were hoed off without disturbing the soil. Delaying cultivation early in the season, especially for 6 weeks or longer, resulted in loss. Laying by deep in the tassel or roasting ear stages resulted in no average gain. The respective increases in yields of corn after a legume had been plowed under or cut for hay in the year before the corn were after cowpeas 22 and 11.7 bu.; soy beans 20.4 and 5.6 bu.; velvet beans 11.3 and 10.1 bu.; Hubam sweet clover 4.3 and 13 bu.; cowpeas after oats 13 and 7.2 bu.; and soy beans after oats 7 and 0 bu. increase.

The sirup production from sorgo varieties ranged from 15 gal. per acre by Black Amber to 207 gal. by Kentucky Honeydew, a strain of Honey sorgo, and the juice percentage varied from 27 to 55, and the ratios of juice to sirup ran from 5.51:1 with African to 16.44:1 with Black Amber. Honey sorgo was found to contain the highest percentage of reducing sugar. In tests of reagents and methods for clarifying the juice, the difference in results did not justify the cost of centrifuging. The clearest juice was obtained by heating to 95° C. and adding lime, which was found to be the best reagent for clarification. The use of filters was found to be impractical.

The depth of leaf cleft in cotton, the brown color of lint, and the green color of lint each seemed to follow the same mode of inheritance, i. e., a modified monohybrid, as was found in plant color (E. S. R., 58, p. 27). Results of linkage tests between these characters and plant color are also recorded. Spacing tests indicated that earliness and total production are affected more by the stand in some years than in others. Stands thicker than are usually considered normal seemed desirable for both earliness and yields. The data showed that hand labor can be saved by thick planting, cross harrowing, and careful cultivation.

The relative yield increases in terms of investment are shown for several fertilizer materials and mixtures used on cotton in different localities in the State in 1927, and the response shown by fruiting characters of cotton to varying rates of nitrogen, phosphorus, and potassium is reported briefly. Compared with sodium nitrate alone, ammonium sulfate alone and with sodium nitrate returned small average increases in seed cotton at the cotton substation, whereas other nitrogen carriers returned lower yields. Calcium nitrate and sodium nitrate led the nitrogen sources used without phosphates or potash. None of the materials produced either marked or consistent differences in earliness.

Fair yields and good quality of alfalfa hay were had from the first two cuttings, whereas the third and fourth cuttings contained a high proportion of weeds, especially crabgrass. Varieties did not differ much in yield, although Grimm led in resistance to weeds and purity of hay. Manure, phosphate, and potash stimulated yields, but like cultivation, did not have much effect on stand. Reduction in stand seemed due to the direct killing of plants by low temperatures, by freezing as a result of rapidly fluctuating temperatures, or by partial freezing and subsequent fungal and bacterial invasion of the root and crown system. Northern varieties maintained their stand longer than southern sorts. Winter dormancy seemed to be an essential for any variety to thrive in the region. Decided increase in winterkilling was noted on areas where plants were cut late in the fall.

Most of the legumes tested produced their best growth at a soil reaction of from pH 6 to 6.8. The range of acid tolerance noted among legumes used going from high to low pH was serradella, subterranean clover, vetch, spotted bur clover, Austrian pea, Canadian pea, soy bean, crimson clover, Hubam sweet clover, and white biennial sweet clover.

For potatoes phosphorus was the most important element and nitrogen was next, whereas no benefit could be attributed to potassium. The 10-5-5 (P-N-K) and 10-5-0 formulas were outstanding in stimulating production. A yield increase of 40 per cent occurred where 20 tons of manure per acre supplemented the fertilizer. In efforts to break the rest period of potatoes, ethylene chlorohydrin treatments induced germination at once and with favorable conditions afforded satisfactory results. Tubers thus treated rot readily where the soil temperature is very high. Germination had by treatment with commercial lime sulfur was slightly below that due to ethylene chlorohydrin. The yield from late planted potatoes using seed stored at 90° F. was better at the station and at Hope than from the chemically treated seed planted 4 weeks before, just after digging.

Phosphorus was also the prime need of sweet potatoes at the station, whereas omission of nitrogen or potassium did not make much difference. The use of 500 lbs. of 10-5-5 fertilizer was as good as 1,000 lbs. or more. The three elements were similar in value at Hope on Ruston fine sandy loam.

[Agronomic experiments in Guam, 1927], J. GUERRERO (*Guam Sta. Rpt. 1927, pp. 4-8, fig. 1*).—Continued investigations included trials of lawn and forage grasses; variety tests with alfalfa, soy beans, pigeon peas, rice, sweet potato, cassava, and yam; and production trials with henequen, maguey, sisal, taro, and edible canna.

Napier and Guatemala grasses, mainly because of their much heavier yields, decidedly surpassed other grasses tested for green forage for livestock on thin clay loam underlain by coral limestone. On rocky limestone hillsides Napier grass produced the highest forage yield and was followed in order by Guatemala, Merker, and *Pennisetum setosum* grasses, and Japanese cane. Napier grass receiving ground limestone (cascajo) yielded much more forage than when treated with burnt lime or coconut cake, or not treated. In fertilizer tests with Japanese cane and Napier grass, plats receiving lime and manure in combination produced the highest yield, and with the Guatemala grass the lime treatment gave the best results.

When heavy growths of aroma (*Acacia farnesiana*) was first slashed and burned a planting of Porto Rico sweet potatoes given two cultivations grew enough to suppress and eventually kill the aroma and yielded 4,720 lbs. per acre. The sweet potato plat receiving superphosphate (acid phosphate) in combination with ammonium sulfate and potassium sulfate produced the highest yield and was followed by the plat treated with superphosphate and stable manure. Of the seven yam varieties under test, five made increased yields due to trellising. In the trellised rows *Dioscorea alata* with 8,378 lbs. produced the highest yield, and *D. latifolia* the lowest, while in the untrellised rows Haya with 4,840 lbs. yielded the most and the wild yam, or gado, the least.

[Field crops investigations in Washington], E. G. SCHAFER, O. E. BARBEE, E. F. GAINES, O. C. LEE, S. C. VANDECAVEYE, O. M. MORRIS, H. J. JENSEN, C. L. VINCENT, H. M. WANSER, I. M. INGHAM, C. E. HILL, and H. P. SINGLETON (*Washington Col. Sta. Bul. 229 (1928), pp. 13–16, 17, 37, 38, 45, 46, 47–49, 52–54, 56, 57*).—Continued agronomic activities (E. S. R., 59, p. 31) reported on from the station and substations embraced varietal trials with winter and spring wheat, oats, barley, corn, alfalfa, potatoes, and sweet potatoes; breeding work with wheat, oats, and potatoes; cultural tests with wheat; weed control studies; pasture tests; and crop rotations.

Sodium chlorate in the form of spray was the most effective of chemicals used to control bindweed at the station, while salt at about 1 lb. per square foot completely controlled the weed at Waterville.

Previous results with regard to the inoculating power of different strains of alfalfa nodule bacteria and their effect on the host were confirmed. Optimum moisture conditions for plant growth at seeding time were found necessary for reliable results from inoculated alfalfa seed.

Most of the potato crosses showing resistance to or immunity from virus diseases have McCormick or Early Norther as one of the parents. Early Norther × McCormick has been very successful in the number of apparently resistant seedlings produced, whereas the reciprocal cross has given no seedlings showing resistance. Other resistant seedlings are noted. Potatoes at the Irrigation Substation in pit storage showed less shrinkage with increased ventilation. Maturity does not materially affect keeping quality of Netted Gems. Immature tubers seemed to proceed quite naturally to maturity in storage. Exposure to the sun for from 1 to 8 hours after digging did not affect the storage quality of potatoes, although the tubers picked up immediately lost more weight in shrinkage than did the potatoes exposed several hours. The latter evidently had their shrinkage during the period of exposure. When Irish Cobbler potatoes were subjected to varying temperatures and to several periods of exposures at harvest to determine the extent of heat necrosis resulting therefrom, it was found that whenever the air temperature approaches 95° F. or above it is dangerous to leave early potatoes exposed for more than half an hour before picking up and placing in cool shade. While potatoes exposed to 95° or more for 2 or 3 hours are apparently uninjured when examined immediately, they will show from 50 to 80 per cent breakdown and decay within 48 hours.

Sweet potatoes with 15 per cent of moisture removed kept much better in storage than those with 5 or 10 per cent or no moisture removed. If weather conditions at harvest permit, much moisture can be removed and the keeping quality of the crop improved by several days' exposure before picking up.

Small grain tests, R. P. Bledsoe (*Georgia Sta. Bul. 149 (1928), pp. 35*).—Extensive varietal tests with small grains at the station and elsewhere in Georgia showed that Purplestraw wheat could be recommended for all wheat-growing sections of the State. Red May and some good strain of Fulcaster, such as Dietz, seemed satisfactory for the Piedmont section. Hundred Bushel, a strain of Red Rustproof, proved to be the best oats available commercially, although several other Red Rustproof strains not on the market outyielded it by 4 or 5 bu. per acre. Although Fulghum yielded less, it could be used where early oats are desired. Fulghum and Red Rustproof gave the best yields of the spring planted oats. However, the yields of spring planted oats varieties were but slightly more than half those when fall planted. Greece and Tennessee Winter Hooded were the best barleys, the latter being preferred for its lack of objectionable awns. Abruzzi and Georgia were the highest yielding ryes.

Comparison of the best oats, barley, and corn in variety tests during seven years in the same field showed that as much or more grain per acre can be obtained with oats or barley as with corn. A comparison of oats, wheat, and barley for hay, based on their total yield of straw and grain, indicated that generally varieties making a high grain yield also give a high yield of hay. Wheat and barley compared very favorably in yields with oats for hay, and their winter hardiness was greater. Good strains of Red Rustproof oats, Purplestraw wheat, and Tennessee Hooded barley seemed best for hay.

The cultivation of perennial forage plants for seed, P. D. Zhuravlev (*Kul'tura Mnogoletnikh Kormovykh Rastenii na Semena. [Novocherkask]: Gosud. Inst. Izuch. Zasushl. Oblast.; Vologda: Vologodsk. Gosud. Selsk. Khoz. Trest, 1927, pp. 104*).—Practical information is given on the distribution, adaptation, culture, harvesting, and storage of important grasses and legumes for seed.

Production and preparation of seed of important clovers and grasses, W. Fischer (*Samengewinnung und Saatgutbereitung bei den Wichtigsten Klee- und Grasarten. Berlin: Oscar Schlegel, 1928, vol. 1, pp. 380, pls. 2, figs. 155*).—Part 1 of this volume treats of the environmental and cultural needs, harvesting, and pests of grass and clover seed, and their valuation, and gives special information in regard to the production, markets, varieties, and cultural needs of the individual species. Important contaminating crop and weed seeds are listed. Part 2 is devoted to a discussion of methods and principles for the preparation of seed, and details the usual means for removing the several classes of impurities and for cleaning particular clovers and grasses. Machines and devices for cleaning seed are described and illustrated in an appendix.

Cotton variety test, 1928, R. P. Bledsoe, H. K. Brabham, and G. A. Hale (*Georgia Sta. Circ. 83 (1929), pp. 3*).—Lightning Express, Half-and-Half, and Piedmont Cleveland were among varieties outstanding in yields in several localities. Foster 4, Delfos 6102, and Deltatype returned high yields in the Piedmont section. Variety rankings were similar in the Piedmont tests and in the Coastal Plain tests. The lint percentage was the higher in the Coastal Plain, whereas the same variety produced the larger bolls in the Piedmont.

Cotton spacing.—I, Studies of the effect on yield and earliness, J. O. Ware (*Arkansas Sta. Bul. 230 (1929), pp. 84*).—Spacing experiments with cotton at Scott, Marianna, and other localities in the State from 1921 to 1926, inclusive, were concerned with the relation between stands and earliness (first picking) and stands and total production. The results of the several trials are given in detail.

Earliness and total production evidently were affected by the stand more in some years than in others. When conditions favored the crop throughout the season, cotton could adjust itself to a wide range of stand without materially affecting production. Usually earliness was advanced more by thicker stands than was total yield, although both were depressed slightly on unthinned plats. When the boll weevil or other late season hazards retarded the fruiting rate the advance in earliness through thicker stands was followed by increased production. In this way, the earliness and total yields of a late variety were enhanced more than those of an early cotton.

Under ordinary farm practice there seemed to be slight danger of the farmer leaving the plants too thick in the row, and this also held true in regard to the influence of spacing experiments. The stand occurring in rows having two or three plants a hoe width (8 in.) apart, or a slightly thicker stand, was the best from year to year. The row evidently should be about 3.5 to 4 ft. wide on rich land, 3 to 3.5 ft. wide on land of average fertility, and 3 ft. or less on poor land.

Fertilizing cotton, C. B. Anders (*Mississippi Sta. Circ. 83 (1929), pp. 7*).—From extensive tests at the station and substations (E. S. R., 59, p. 827) information is given in regard to the profitableness of fertilizers, the proper analyses and rates, nutrient carriers, methods of application, and specific formulas for different soil types in the State.

Cotton production [trans. title], **H. V. Geib** (*Estac. Expt. Agr. Soc. Nac. Agr., Lima, Circ. 9 (1928), pp. 19*).—Practical information on the production of cotton in Peru.

Rôle of mother tuber in growth of potato plant, F. E. Denny (*Bot. Gaz., 87 (1929), No. 1, pp. 157–194, figs. 5*).—Mother tubers (sets weighing 28 gm. each) were amputated from potato plants in experiments at the Boyce Thompson Institute for Plant Research when (stage 1) the sprouts first emerged from the soil and before the leaves had expanded, (stage 2) when the plants were about 2 in. high and leaves fully expanded, (stage 3) when plants were about 10 in. high and young tubers were forming on well-developed stolons, and (stage 4) when plants had attained about maximum height and were in bloom. Plants having sets removed at stages 1 and 2 yielded about 33 and 80 per cent respectively of the production of the corresponding checks. While varietal differences were noted in behavior in stages 3 and 4, it appeared possible that the sprout became independent of the set at stage 3. Most of the storage materials that were destined to leave the set had already been used up.

Chemical analyses showed a rapid loss of substance from the set, 25 to 33 per cent at stage 1, about 50 per cent at stage 2, and nearly 80 per cent at stage 3. The depletion varied with different lots in different years and with different varieties but ranged from 70 to 85 per cent. Starch and the various forms of nitrogen were steadily used up, whereas the sugar concentration was maintained at a high level. Different groups of nitrogenous substances, such as insoluble, soluble, ammonia, amide, amino, and basic, were removed from the set at about the same rate. There was no evidence of one form being more readily available for growth than other forms. Although the foliage was active photosynthetically between stages 2 and 3, large demands upon the organic substance of the set were made during this period.

Variety tests of white potatoes, L. O. Gratz (*Florida Sta. Bul. 201 (1928), pp. 303–314*).—Comparative studies during 5 years with several potato varieties in representative localities of the Hastings potato district and at the Everglades Substation are reported on. Although the seasons during the experiments were extremely variable, both as to temperature and rainfall, Spaulding Rose No. 4, the current standard variety for Florida, was rather consistently outyielded in primes by Irish Cobblers, Green Mountains, and Bliss Triumphs.

Longevity of sugarcane pollen, N. L. Dutt (*Agr. Jour. India, 23 (1928), No. 6, pp. 482, 483*).—By keeping sugar cane pollen in sealed glass tubes at from 9 to 13° C., a few germinations were obtained as long as 168 hours after inclosure. Pollen kept in partial vacuum for 96 hours at the same temperature also gave several germinations.

The variability of the quantitative attributes in pure lines of spring wheat [trans. title], V. N. Mamontova (In *Materialy k Izuchenii͡u Izmenchivosti IArovoĭ Pshenitsy. Saratov: Saratov. Oblastn. Selsk. Khoz. Opytn. Sta., 1927, pp. 3–39*).—Investigation during five years on the selection of hard and soft wheats, involving study of various agronomic, morphological, and developmental characters, demonstrated that the study of variability in the quantitative characters of crop plants in relation to the influence of environment is essential to selection work. Quantitative characters according to their coefficients of variability are distributed into four groups—characters not constant, with a large coefficient of variability; characters varying strongly, such as those determining productivity; characters of medium variability, e. g., those belonging to the morphological group; and slightly variable characters. The degree of variability of the characters seemed directly related to the meteorological conditions and to the heritable properties of the plant. The hard wheats varied more than the soft wheats in unfavorable years. The average values of different characters varied with the meteorological conditions.

Variety testing of spring wheats for 1915 to 1925 [trans. title], N. F. Emel'i͡anov (In *Materialy k Izuchenii͡u Izmenchivosti I͡Arovoĭ Pshenitsy. Saratov: Saratov. Oblastn. Selsk. Khoz. Opytn. Sta., 1927, pp. 66–95*).—Comparison of yield and meteorological data during the course of extensive varietal trials with spring wheat showed that the duration of a test for a variety requires the determination of productivity during several seasons of different conditions. Adequate checks are needed for statistical interpretation of results. The period from stooling to heading, which appeared rather constant for a variety in different years, is held important in determining varietal productiveness. Meteorological conditions during this period, especially precipitation, are important yield factors, while those from heading to ripening determine the development of the kernels. In a dry year the weather during the heading to ripening period largely determines yield in spring wheat, whereas the effect is slight in the period up to heading.

Report of the Hard Red Winter Wheat Research Conference (*[Manhattan: Kans. Agr. Col.], 1928, pp. [2]+81*).—This is the report of the proceedings of the conference held at the Kansas State Agricultural College in November, 1928 (E. S. R., 60, p. 400). The papers presented included The Need for an Enlarged Wheat Research Program for the Southern Great Plains, by F. D. Farrell (pp. 14–16); What a Research Program Will Mean to the Wheat Farmer, by E. H. Hodgson (pp. 17–19); Progress and Needs in the Improvement of Hard Red Winter Wheats by the U. S. Department of Agriculture, by C. R. Ball (pp. 20–29); Research of the Bureau of Agricultural Economics of Wheat Marketing as Affected by Quality, by H. R. Tolley (pp. 30–33); Research as a Basis for a Wheat Improvement Program, by H. M. Bainer (pp. 34–38); Why the Southwest Needs Improved Wheat Varieties, by C. C. Cunningham (pp. 39–41); How an Enlarged Research Program May Help the Millers in the Solution of Some of Their Problems, by C. M. Hardenbergh (pp. 42–45); The Importance of Quality in Hard Red Winter Wheat, by S. F. McDonald (pp. 46, 47); The Colorado Wheat Improvement Program, by A. Kezer (pp. 48–54); An Enlarged Research Program Relating to Wheat Improvement in Kansas, by L. E. Call (pp. 55–60); The Nebraska Winter Wheat Research Program, by W. W. Burr (pp. 61–65); More and Better Wheat in Oklahoma, by C. E. Sanborn (pp. 66–68); and The Texas Viewpoint of Wheat Improvement, by A. B. Conner (pp. 69–75).

A survey of the 1928 North Dakota wheat crop, C. E. Mangels, T. E. Stoa, and R. C. Dynes (*North Dakota Sta. Bul. 222 (1928), pp. 23, figs. 8*).—The survey of the 1928 wheat crop, similar to previous undertakings (E. S. R., 58, p. 433), showed common wheat (649 samples) to average 59.5 lbs. per bushel and (790 samples) 12.12 per cent of protein, and durum wheat (272 samples) 61.4 lbs. and (308 samples) 11.2 per cent.

While for the State as a whole, wheat following cultivated crops and legumes averaged higher in protein content than wheat after small-grain crops, limited data from four eastern counties showed no advantage for cultivated crops, although an appreciably higher protein average was apparent for wheat after legume crops. In four western counties wheat after cultivated crops averaged 12.62 per cent protein, as compared to 12 per cent after small grains. Durum samples from four counties in northeastern North Dakota showed a similar advantage in protein content when following cultivated crops. Comparisons with wheat from weedy and clean fields in Golden Valley County by J. C. Russell indicate that weed infestation tends to lower the protein content of wheat.

Seed value of frosted wheat, W. O. Whitcomb (*Grain Dealers Jour., 62 (1929), No. 3, pp. 172, 173, figs. 3; also in Seed World, 25 (1929), No. 4, pp. 12, 13*).—According to results of studies at the Montana Experiment Station (E. S. R., 60, p. 228), the stage of maturity at freezing and also the temperature and duration of frost decidedly affect the value of frosted wheat. Frosted wheat giving a strong germination test of 70 per cent or more may be used safely for seed, but the seed value of such wheat is uncertain without thorough laboratory tests. Frosted wheat is best tested for germination during February and March.

HORTICULTURE

[Horticultural investigations at the Arkansas Station] (*Arkansas Sta. Bul. 231 (1928), pp. 50–62, 63, 64, figs. 6*).—Experimental progress is discussed much in the same manner as in the preceding report (E. S. R., 58, p. 331).

Cold weather just prior to and succeeding pollination materially interfered with the results of apple studies conducted by J. R. Cooper and C. B. Wiggans. Of four pollens, Delicious, Jonathan, Ben Davis, and Yellow Transparent, used on Ben Davis flowers, Ben Davis pollen was strikingly inferior. An examination of the pistils showed generally greater length for Delicious, Yellow Transparent, and Jonathan pollen tubes in the order given than for Ben Davis tubes. Except for shortness the Ben Davis tubes were similar to the others. A similar examination of Stayman Winesap pistils showed Stayman Winesap tubes to be shorter than those of other varieties and with some enlarged ends, a condition which was, however, observed in other varieties. Boiling the pistils for 2 minutes in N/10 acetic acid greatly facilitated the removal of the outer integument and allowed successful study of the tubes when stained with an aqueous solution of lacmoid. In most cases tubes which had reached the ovule had already disintegrated in the upper part of the pistil. Of two possible factors interfering with self-pollination, namely, the presence of inhibiting substances and insufficient nutrition, the latter is considered the more probable.

Studies by Cooper and Wiggans of the causes of abscission of immature apples suggested that lack of pollination is not a frequent cause, since pollen tubes were found in nearly all instances at least in the upper portion of the pistil. Where fertilization had apparently occurred, it is believed that dropping was caused by the early initiation of abscission. The second heavy drop consisted almost entirely of fertilized fruits and is believed the result of competition. Fruits with few seeds dropped first, and between fruits of equal seed number the amount of supporting foliage was the determining factor.

Observations by Cooper and Wiggans on the time of flower bud differentiation in apples showed some varietal and seasonal differences and some differences between trees of a single variety. In 1927 bud samples taken June 15 showed some flower primordia.

Cooper and Wiggans noted an apparently definite correlation between the number of fruits per spur and the number of leaves, old and new shoot length, and spur growth of the preceding year. The dropping of fruit from trees receiving different treatments or differing widely in vigor followed the same general curve unless the treatments were strikingly different. Yield was apparently largely dependent on the number of fruit spurs per tree. A positive correlation was observed between tree vigor and production. Increment in the trunk girth was found the most reliable index to the tree's vigor and potential fruitfulness. Trunk growth continued through August, while terminal growth ceased about the middle of June.

Analyzing the results of several years Cooper reports that both nitrogen and phosphorus have proved beneficial to the apple, giving respective increases of 3 and 1 bu. per tree per year. Potash gave no increase and in certain instances caused reductions. Nitrate of soda had a quicker influence than ammonium sulfate, but by the third year all differences had disappeared. Size of fruit was influenced by number per tree but not by fertilizers. Nitrogen through development of rank foliage invariably reduced fruit color, but phosphorus or potash had no such effect. No fertilizer had any apparent influence on quality. The increased production of fertilized trees was due largely to increased number of fruit spurs.

Cooper and Wiggans report that nonpruned fruit trees over a 4-year period outyielded heavily pruned and moderately pruned trees, the gain being directly correlated with the number of fruit buds.

A girdling test conducted by Wiggans with 7-year-old apple trees showed complete girdling in late May to strikingly increase flower bud formation. Partial girdling was ineffective.

Fertilizer studies with the peach conducted by Cooper and Wiggans showed nitrogen to be highly effective on growth and production. Fruit ripening was delayed and color reduced on nitrogen trees. Judging by the weight of prunings, nitrogen fertilizers stimulated the growth of grapevines.

Wiggans found that shortening the canes of frost-injured grapevines reduced the crop but greatly stimulated the production of strong canes for the succeeding year. Simply removing the injured shoots slightly increased the current crop. A comparison of grapes on their own roots and on Xlanta, Wine King, and Cynthiana roots showed in favor of grafting in the case of two varieties but no apparent difference with Concord. Grafting on rooted cuttings gave better results than on unrooted cuttings. The pruning of 1-year grape plants prior to setting reduced growth, there being a fairly definite inverse correlation between severity of pruning and subsequent growth. Staking young vines greatly increased length above that of recumbent canes and shortened the period of nonproduction. The time of pruning Concord vines had no appreciable influence on the time of blooming. The initiation of fruit bud formation in the Concord grape began about July 1.

Of several fertilizers tested by Cooper and V. M. Watts for the tomato those containing phosphorus materially hastened ripening and increased yields, apparently by stimulating early growth. Nitrogen proved of little value, but manures materially increased yields. In tests by Watts, electric light supplied in addition to normal daylight increased the length and diameter of stem growth in John Baer tomatoes of moderate and nonvigorous growth. Under the conditions of the experiment bud formation and fruiting were directly correlated with vegetative growth.

[Horticultural investigations at the Guam Station], J. Guerrero (*Guam Sta. Rpt. 1927, pp. 9–12, fig. 1*).—Continuing the policy of introducing new fruits (E. S. R., 59, p. 529), the White mountain apple, the star apple, the Surinam cherry, and the lanzone were imported during the year. Improved varieties of avocado, mango, and orange were propagated for distribution.

Storage studies with native forms of orange known locally as the naranghita and cahit indicated that under proper conditions the latter could be held for a considerable period. The naranghita yellow orange, a tangerine, proved to possess poor keeping qualities. Dipping oranges in a 1:500 copper sulfate solution proved of no benefit. Care in harvesting was an important factor in lengthening the keeping period.

Trial shipments of avocados, watermelons, and vegetables sent to the Philippine Islands were successful. The progeny of crosses between the Gulf State Market and Greater Baltimore tomatoes yielded better than the native varieties. Of four cabbages tested, the Florida Drumhead produced the largest number of heads.

[Horticultural investigations at the Washington Station] (*Washington Col. Sta. Bul. 229 (1928), pp. 21, 22, 32–37, 38, 54–56, 61, 63, 64*).—The usual annual report on horticultural activities (E. S. R., 59, p. 39).

Studies by J. R. Neller upon the removal of arsenical residues indicated that the acid cleaning solution was increased in effectiveness for waxy apples when heated to about 100° F. Pears did not require heated solutions. The dipping of waxy fruits in nontoxic solvents prior to the acid wash was successful. Arsenic accumulation in the cleaning solution necessitated frequent change. Various lead arsenate preparations similar in chemical composition were found to be quite different in their physical properties.

Working on the breakdown of apples in storage Neller found that apples which developed excessive breakdown came from trees whose shoots were low in catalase activity. The fruits were lower in catalase activity and acid and higher in total sugar than were more normal fruits. Although a coating of oil checked respiration, shriveling, and loss in weight, there was no apparent effect on dessert quality.

J. L. St. John working on the winter hardiness of fruit tree shoots found no correlation between pentosans and hardiness. Differences in sugar were sometimes greater on different parts of a tree than between varieties. Total sugars and sucrose decreased from winter through spring. Soluble nitrates decreased in May, and H-ion activity also decreased in spring. The amino nitrogen concentration was very small throughout winter and spring.

Observations by O. M. Morris, H. J. Jensen, F. L. Overley, and W. A. Luce in the Spokane, Wenatchee, and Yakima Valleys showed generally inferior stands of legume cover crops, weeds and grass often comprising most of the cover. Pollination studies conducted by Luce and Overley in the Wenatchee district indicated that Moorpark, Tilton, Gilbert, and Southerland apricots were sufficiently self-fertile. Tree variability was noted in the Black Republican, Deacon, and Shelton cherries in respect to their ability to fertilize Bing, Lambert, and Napoleon (Royal Ann). The Black Tartarian and the Centennial varieties gave uniformly favorable results. None of 14 pear varieties tested as pollinizers for Anjou gave satisfactory results. Stayman Winesap and Red Winesap proved unsatisfactory pollinizers for Winesap and Delicious, and Winesap, Stayman Winesap, and Golden Delicious pollens gave poor results on Delicious.

As determined by J. R. Magness and Luce, Delicious apples grown on ringed branches with definite leaf areas per fruit required 30 and from 40 to 50 leaves, respectively, for producing good sized and very good apples. The leaf area of Delicious averaged 3.65 sq. in., being larger than that recorded in Virginia (E. S. R., 56, p. 836). Fruit grown with sufficient leaf area was higher in sugar, better colored, and larger than that grown with less foliage. Fruits grown with 75, 50, 30, 20, and 10 leaves, respectively, averaged 58, 51, 42, 26, and 23 per cent of solid red color, and in weight 211, 201, 170. 134, and 94 gm.

As reported by Magness, collar rot or crown injury of the apple occurs frequently in irrigated districts and is most severe in abundantly watered, moderately heavy soils or near head ditches.

Morris and Jensen treated hardwood cuttings of Delicious and Winesap apples with nitrate of soda solutions of various strengths without obtaining any beneficial effect on rooting. Some promise of success was secured with softwood cuttings. Determinations by Magness and Overley of starch development in apple foliage which had been sprayed with oil and with arsenate of lead alone indicated that light oils had no effect on starch formation, as measured by the chlorophyll and iodine tests. Studies with excised twigs indicated that oil tends to reduce transpiration rates, corroborating the results of Kelley (E. S. R.. 58, p. 232). The effect continued several days after the spraying. Ringed branches sprayed with oil showed no decrease in fruit size in the case of Jonathan, but with Winesap and Delicious repeated applications of heavy oils apparently decreased size.

Working on peach maturity as related to picking for storage, Morris found that each variety has characteristic changes in appearance and that these changes are affected by weather and other environmental conditions. Fruits nearly or quite fully grown and beginning to soften held up in storage for from 10 to 28 days.

Tomato breeding studies conducted by C. L. Vincent included a study of the F_1 generation of a cross between Bonny Best and Sutton Best of All. Favorable results were secured only when the Bonny Best was used as the ovule parent.

Studies conducted by Jensen at Prosser showed that light pruning results in maximum yields, but in some cases the fruits of the lightly pruned trees were poorly colored and reduced in quality by limb rub and leaf scars. Cover crops hastened terminal bud formation by from 7 to 10 days as compared with clean culture. The yields were largest on cover cropped plats receiving normal irrigation.

Attempts to grow own-rooted apple trees by using long scions on nurse roots gave negative results, even when encircled with wire just above the root. That nitrogen increases vigor and yield of apple trees was indicated in a comparison of nitrogen, potash, and phosphoric acid. As measured in yields of wheat following plowing under, sweet clover, red clover, and alfalfa in the order named were the most effective among seven legume crops. Variable results obtained in pollinating Bing, Lambert, and Napoleon cherries with pollen from separate trees of Black Republican suggested that this variety is made up of distinct strains.

At the Cranberry Substation, D. J. Crowley reported that following a severe frost while the buds were in the pink stage it was observed that berries were larger on bogs which had been irrigated the preceding season. Bogs having a thin cover of sand suffered more frost injury than well sanded bogs. A 5 per cent oil emulsion plus 2 per cent cresylic acid was found effective for killing swamp grass and sedges. Emulsion was more effective and cheaper than undiluted oil. Distillate was more effective as a weed killer than either gasoline or kerosene and when properly applied was used without serious injury. Resanding as a means of holding the vines was found necessary before using a gasoline driven mechanical picker.

Tests of the influence of certain factors on the ripening of some horticultural products.—II, The effect of ethylene on the ripening of various fruits and vegetables [trans. title], R. MULDER, L. J. M. OELMEYER, and A. M. SPENCER (*Landbouwk. Tijdschr.* [*Amsterdam*], *41* (*1929*), *No. 487, pp. 78–92, fig. 1; Eng. abs., p. 92*).—In tests with bananas, pears, tomatoes, cucumbers, melons, and celery no acceleration of the ripening process was noted as a result of exposure to ethylene gas used at the rate of 1 liter per cubic meter of space and at a temperature of from 25 to 26° C., with a relative humidity of from 85 to 95 per cent.

Vegetables, flowers, and fruits under glass, O. LÖWE (*Gemüse-, Blumen- und Obstkulturen unter Glas. Stuttgart: Eugen Ulmer, 1928, pp. VIII+189, figs. 48*).—The general principles and practices and the needs of specific plants are discussed.

Commercial varieties of vegetables for New York State, H. W. SCHNECK (*N. Y. Agr. Col.* (*Cornell*) [*Ext.*] *Bul. 176* (*1928*), *pp. 83, figs. 50*).—Descriptions are given of a large number of varieties of various species of vegetables grown in New York.

A comparative study of the cabbage varieties in relation to morphology, productivity, and quality of head [trans. title], E. PANFILOVA (*Saratov. Oblastn. Selsk. Khoz. Opytn. Sta., Kratk. Otchet Rabot. Otd. Sadovod. i Ogorod. 1926, pp. 33–41*).—The results of biometrical studies with cabbage varieties are presented in tabular form with discussion.

Studies in Indian chillies.—I, The types of Capsicum, F. J. F. SHAW and A. R. KHAN (*India Dept. Agr. Mem., Bot. Ser., 16* (*1928*), *No. 2, pp.* [*2*]*+59–82, pls. 5, figs. 3*).—In this systematic study, begun in 1924, some 52 types of Capsicum, 49 of which were natives, were described and classified. The biology of flowering and fertilization is discussed. Both cross- and self-fertilization were observed to be common in occurrence; for example, in 96 unprotected cultures growing side by side 75 showed segregation and 21 bred true in the next generation. Yellow fruit color and erect growing habit were found recessive to red color and pendent habit.

Bermuda onion culture, J. T. QUINN (*Missouri Agr. Col. Ext. Circ. 215* (*1929*), *pp. 8, figs. 4*).—Information of a general nature is presented.

Germination and keeping quality of parsnip seed under various conditions, H. C. JOSEPH (*Bot. Gaz., 87* (*1929*), *No. 1, pp. 195–210, figs. 2*).—Studies at the Boyce Thompson Institute for Plant Research on the storage of parsnip seeds indicated the advisability of thorough drying followed by storage in air-tight containers held at moderate temperatures. Temperature and humidity were both important factors in parsnip seed storage, but of the two humidity is deemed the more important. With moisture content high temperature should be low, and reciprocally with temperature high moisture content must be at a minimum. As a result of the study two methods of storing are recommended—(1) at ice-box temperature, approximately 5° C., and (2) at ordinary storage temperature preceded by a thorough drying of the seeds at 90° for from four to six hours, and subsequent storage in air-tight containers.

Work on tomatoes in 1926 [trans. title], E. PANFILOVA (*Saratov. Oblastn. Selsk. Khoz. Opytn. Sta., Kratk. Otchet Rabot. Otd. Sadovod. i Ogorod. 1926, pp. 43–51*).—A report on varietal and pruning studies with the tomato. Pruning gave favorable results, the unpruned and the slightly pruned plants being poorer in every respect.

Catalase and oxidase of the tomato as influenced by the soil reaction, E. S. HABER (*Iowa State Col. Jour. Sci., 3 (1928), No. 1, pp. 29–39*).—From data obtained at the Iowa State College on Bonny Best tomato plants set in greenhouse beds in composted soils having three pH values, from 8.5 to 9, 6.5 to 7, and from 4 to 4.5, respectively, the author concludes that there is in the tomato a definite relation between catalase activity in the plant and the amount of growth and yield. Plants in soil with a pH value of from 6.5 to 7 gave higher yields and made greater growth, as measured in total dry matter, than did plants in soils of the higher or lower pH value. The lowest yield per plant was on the alkaline plat, pH 8.5 to 9. The greatest amount of total dry matter per plant was produced on the neutral soil.

Differences in catalase activity were most pronounced in the case of green ripe fruits, the highest yielding plants, from plats with a soil reaction of from pH 6.5 to 7, consistently showing the lowest activity. No consistent differences in catalase activity were noted in very immature fruits. Soil reaction and subsequent growth and yield had no apparent influence on oxidase activity, although there was some evidence of greater activity in mature than in immature fruits. Oxidase and catalase activity were apparently independent of one another.

Some results of pruning experiments with deciduous fruit trees, O. S. H. REINECKE (*Union So. Africa Dept. Agr. Bul. 43 (1928), pp. 15, figs. 7*).—Experiments at the University of Stellenbosch, South Africa, showed that severe pruning of plums and pears retards the initiation of fruiting. Severe pruning was observed in the case of the Santa Rosa plum to have a greater reducing effect on growth than did heavy fruiting. This inhibiting effect of pruning on growth was not as noticeable in the pear; for example, in the Bon Chretien (Bartlett) heavy fruiting had more influence than pruning in reducing growth. Summer pruning was not effective and even deleterious. A program of moderate pruning combined with fruit thinning in case of overproduction is suggested.

[Spray calendars for New Jersey fruits] (*New Jersey Stas. Circs. 213 (1928), pp. 4; 214, pp. 4, figs. 3; 215, pp. 3*).—These spray calendars are entitled, respectively, 1929 Spraying and Dusting Recommendations for Apples, 1929 Spray Calendar for Peaches, and 1929 Spray Calendar for Pears, and are supplemented with pertinent information on pests and spray materials.

A short report on the work of the pomological subdivision [trans. title], M. A. NOVIKOV-GOLOVATYĬ (*Saratov. Oblastn. Selsk. Khoz. Opytn. Sta., Kratk. Otchet Rabot. Otd. Sadovod. i Ogorod. 1926, pp. 7–32*).—Studies of the flowers of the apple, pear, cherry, and plum showed that the ratio between length and maximum width of petals is a varietal constant. Three series of stamens were noted, the outer series containing as many as the two inner series combined. From measurements of fruits the author has prepared varietal indexes as an aid in identification. Miscellaneous studies in pruning, culture, fertilization, etc., are reviewed.

Contributions to fruit variety studies [trans. title], R. R. SHREDER (*Trudy Uzbek. Selsk. Khoz. Opytn. Sta., No. 3 (1928), pp. 7–76, figs. 1*).—Records taken upon 125 pear and 127 apple varieties showed marked differences in the number of days required for completing blooming. The range for pears was between 5 and 12 days. In many cases the long blooming period resulted in frost injuries. The length of the blooming period in apples ranged from 5 to 21 days, with an average of 12.5 days for 177 trees. Heavy bloom in 1917 completely destroyed by frost was again followed by heavy bloom in 1918, suggesting that bloom in itself does not reduce the next year's fruiting.

Proper pollination of fruit blossoms, F. S. LAGASSÉ (*Del. Univ., Agr. Ext. Bul. 15 (1928), pp. 20, fig. 1*).—General information is presented upon the pollination requirements of the various cultivated fruits of Delaware.

Pollination studies with cherries and pears [trans. title], H. KAMLAH (*Kühn Arch., 19 (1928), pp. 133–195, pls. 4, fig. 1*).—An enlarged presentation of material previously noted (E. S. R., 60, p. 233).

Self sterility of Zealand cherries, II [trans. title], A. M. SPRENGER and A. K. ZWEEDE (*Landbouwk. Tijdschr. [Amsterdam], 40 (1928), No. 485, pp. 737–741, fig. 1; Eng. abs., p. 741*).—A second contribution to a pollination study with cherries (E. S. R., 58, p. 541).

The varieties Hangblad, Bruine Blanche, Zwarte Blanche, Klerk, Zoete Morel, Markies, Hollander, Early Rivers, Zwarte Spaansche, and Suikerkers were found to be fully self-sterile, but the varieties Enkele Eierkriek and Dubbele Eierkriek were partly self-fertile. In concluding, the authors suggest a method of interplanting and also the use of bees to insure satisfactory pollination.

Peach pruning in Maryland, A. L. SCHRADER and E. C. AUCHTER (*Maryland Sta. Bul. 299 (1928), pp. 36+[1], figs. 35*).—A discussion of the principles and practices of pruning the peach tree, laying particular consideration on the moderate system now in vogue as compared with the severe pruning practiced a few years ago. The use of nitrogen fertilizers, cover crops, and the protection of the trees from borers by paradichlorobenzene are recommended as supplementary steps in supporting the present light pruning system.

Pruning experiments in western Maryland in young Elberta and Belle of Georgia orchards showed lightly pruned trees to come into profitable bearing earlier and to outyield the severely pruned trees consistently. In the case of spring frost injury the lightly pruned trees with their much larger total number of buds were better able to withstand losses.

A new peach training system in which the young tree is cut back at time of planting to 3 ft. instead of the usual 18 to 20 in. and in which all side shoots are shortened to one bud is described. When the new growth is about 2 in. long four well placed shoots are selected as the future limbs and the balance removed. This type of pruning results in a strong framework and rapid development into a sturdy, thrifty tree.

The rejuvenation of old trees and the necessary pruning following the loss of a crop from freezes are discussed.

A device for determining the texture of peach fruits for shipping and marketing, M. A. BLAKE (*New Jersey Stas. Circ. 212 (1929), pp. 8, figs. 2*).—Discussing the various means of determining picking maturity in the peach, the author describes and explains the use of a pressure tester designed for measuring the hardness of the flesh of peaches and thereby determining the stage of maturity. A table of pressures is included to serve as a guide in the use of the tester. For example, in fruit for immediate use the suggested range is from 3.5 to 5 lbs., while in that designed for long distance shipments the range is from 8 to 9 lbs. Noting considerable differences in the firmness of the flesh at various points on a single fruit, the author suggests that readings should be taken at the softest point.

The storage of apples in air-cooled warehouses in Nova Scotia, S. G. Lipsett (*Canada Natl. Research Council Rpt. 23 (1928), pp. 22*).—Briefly discussing the principles of apple storage, the author reports on observations made in commercially operated air-cooled storage houses. In certain cases the storage temperature during the warm months of October and November was actually higher in the house than without. Ventilation was often inadequate, and in certain cases air warmer than the fruit itself was circulated. Estimates of 1,400 cu. ft. of air 5° F. cooler than the fruit as needed to cool a barrel of apples were checked in actual tests. Air entering a storage house at 36° at the rate of 1 cu. ft. per barrel per minute was found to have a temperature of 44.3° as issuing at the door and 46.7° at the ceiling flue. With air 5° cooler outside and no wind blowing ventilation through flues was rapid, but there was little movement when the temperature in and out was the same and strong winds were blowing. The type of cover at the top of the flue materially affected its efficiency. Practical suggestions are given on the construction and management of storage houses.

A fruit survey in Romanic Switzerland [trans. title], H. Faes, G. Lavanchy, and P. Aubert (*Ann. Agr. Suisse, 29 (1928), No. 5, pp. 534-566, pl. 1*).—Technical descriptions and comments are given on the principal varieties of table apples grown in this section of Switzerland.

Bush fruit culture in California, A. H. Hendrickson (*Calif. Agr. Col. Ext. Circ. 25 (1929), pp. 29, figs. 12*).—A general discussion

Blueberry growing—a new industry in Washington, D. J. Crowley (*Washington Col. Sta. Pop. Bul. 144 (1928), pp. 11, figs. 4*).—A general discussion concerning soil requirements, culture, propagation, varieties, control of pests, etc.

Plant selection in the grape, I, A. S. Merzhanian (Merjanian) *Selektsii͡a v Vinogradarstve. La Sélection Appliquée à la Vigne.* [*Anapa*]: *Anapsk. Opytn. Sta. Vinograd. i Vinodel. (Sta. Viticult. et Oenol. Anapa), 1928, pt. 1, pp. 54, pls. 5, figs. 6; Fr. abs., pp. 51, 52*).—Studies at the Kuban Institute of Agronomy upon vines of three varieties of vinifera grapes showed plant variability in all three varieties. In the Aligoté variety, for example, there were observed three mutations, (1) a sterile form with dentated leaves bearing small hairs on the lower surface, (2) a form with acutely pointed leaves and irregularly opening flowers, and (3) a variation with very large leaves. The author believes that all grape varieties are composed of clons, and that this variability is much more frequent than is commonly believed. Mass selection fails to improve the grape because it ignores these plant variations.

Strawberry culture in California, A. H. Hendrickson (*Calif. Agr. Col. Ext. Circ. 23 (1928), pp. 21, figs. 9*).—This comprises general information.

Bananas and citrus, S. C. Harland (*Trop. Agr.* [*Trinidad*], *5 (1928), Nos. 2, pp. 23, 24; 3, pp. 54-56; 4, pp. 90, 91*).—This report discusses observations made on a journey throughout the producing regions of the world. Because of the diversity of types and the existence of wild species southeastern Asia is regarded as the original home of the banana, and it is believed that bananas of the Gros Michel type resistant to the dreaded Panama disease may be obtained from this region. Indications were also found that the original home of the lime is in southeastern Asia.

The breadfruit of Tahiti, G. P. Wilder (*Bernice P. Bishop Mus. Bul. 50 (1928), pp. 83, figs. 50*).—Commencing with a general discussion upon the economic importance, etc., this paper is devoted principally to a description of the numerous varieties.

A cytological study of Cocos nucifera Linnaeus, J. K. Santos (*Philippine Jour. Sci., 37 (1928), No. 4, pp. 417–437, pls. 7*).—Studies of the pollen mother cells of the coconut during the reduction division showed 16 bivalent chromosomes, with occasionally only 15 present, due to overlapping. One of the chromosomes was strikingly larger than the others, while three were smaller.

Australian nuts and nut growing in Australia, H. J. Rumsey (*Dundas, N. S. Wales: Herbert J. Rumsey & Sons, 1927, pp. 120, pls. 5, figs. 21*).—A handbook of useful cultural information.

Root formation and flowering of dahlia cuttings when subjected to different day lengths, P. W. Zimmerman and A. E. Hitchcock (*Bot. Gaz., 87 (1929), No. 1, pp. 1–13, figs. 6*).—Studies at the Boyce Thompson Institute for Plant Research with dahlia cuttings taken at various seasons showed peculiar varietal responses to changes in day length. Cuttings taken in August produced numerous fibrous roots and grew into good sized plants before flowering, while cuttings taken in late September and October produced storage roots at the expense of fibrous roots and flowered when only a few inches high. In some cases the buds along the stem became swollen like tubers. Varietal response differed, certain plants flowering independent of day length while others flowered only with short days. Nitrates accumulated in the leaves and stems of short day plants but were absent or nearly so in long day plants. Very little variation was noted in the pH reaction of stems and leaves of short or long day plants.

Report of 1927 iris breeding experiments at the New York Botanical Garden, C. Chandler and A. B. Stout (*Amer. Iris Soc. Bul. 27 (1928), pp. 31–49*).—Of 395 parental combinations utilized in approximately 2,000 cross-pollinations between beardless types of iris a total of 114 gave successful results. Some success was also obtained in crossing Japanese varieties with the earlier blooming beardless types.

Microchemical studies of rooting and non-rooting rose cuttings, M. C. Carlson (*Bot. Gaz., 87 (1929), No. 1, pp. 64–80, figs. 6*).—Observing that adventitious roots were produced under conditions of high humidity from the new shoots of Dorothy Perkins but not from those of the American Pillar, an examination was made of the food reserves in both varieties, with the result that a higher starch reserve was found in the Dorothy Perkins. The changes in reserves were comparable in both varieties, a hydrolysis of starch accompanied by an increase in reducing sugars, especially in the new shoots. Asparagin was abundant in the branches after from 8 to 11 days. Anatomical differences in the overwintered canes were but slight. In Dorothy Perkins a swelling at the base of the new branches, caused apparently by an unusual development of secondary phloem, was evident, and in this region the adventitious roots were initiated.

Plants in the home, A. F. Yeager (*North Dakota Sta. Bul. 224 (1928), pp. 32, figs. 14*).—Based in large part upon the replies received to a questionnaire sent out to members of the State Horticultural Society, the author presents practical information on the care of plants in the home, discussing such points as temperature, light, soil and water requirements, control of pests, etc. The more common kinds of house plants are considered separately.

FORESTRY

Factors affecting the reproduction of hardwood forests in southern Connecticut, J. L. Averell (*Jour. Forestry, 27 (1929), No. 1, pp. 55–61*).—Studies in hardwood stands near New Haven, Conn., indicated the undesirability of relying on sprout reproduction now that chestnut has been eliminated by disease. By extending the cutting rotation to 80 years or more clear cutting permits plentiful reproduction of seedlings or seedling sprouts. Under favorable conditions partial cutting may serve as a safety measure to insure natural reproduction. Factors deleteriously influencing reproduction are insect and animal depredations on acorns, rabbit injury to young hardwoods, drought, and shrub competition (severest on good soil). The character of the soil determined the suitability of species to various areas and controlled their rate of development. Hardwood slash had no apparent effect on reproduction.

Germination and vitality of birch seeds, H. C. Joseph (*Bot. Gaz., 87 (1929), No. 1, pp. 127–151, figs. 5*).—Afterripening in the form of stratification for about six weeks prior to planting in a moist medium, such as sand or peat, at temperatures of from 32 to 41° F. was found highly effective in increasing the germination of birch seeds; in fact, freshly harvested seeds of *Betula lenta* germinated poorly irrespective of time of season gathered, moisture content, or dry weight at harvest time. Air-dried seeds required a high temperature for germination, either 32° C. constant or an alternation between 15 and 32°. The minimum temperature for air-dried seeds of *B. lenta* was 30°, and 20° for *B. populifolia*, *B. papyrifera*, and *B. lutea*. However, with afterripening under satisfactory conditions the germination temperature requirements were much lower, approximating early spring conditions out of doors. Seeds of *B. lenta* and *B. populifolia* kept perfectly for one year in air-dry storage at room temperatures, but those of *B. papyrifera* kept best when suspended in a closed container the bottom of which was covered with quicklime.

Correlation of total and merchantable height in western yellow pine, W. H. Bolles (*Jour. Forestry, 27 (1929), No. 1, pp. 74, 75*).—Measurements taken in central Idaho on 898 western yellow pine trees, 58 on site 1, 497 on site 2. and 343 on site 3, showed the least difference between total and merchantable height on site 3 and the greatest difference on site 1. The differences varied inversely by diameter classes within a given site, being greatest in the small diameter classes.

The varieties and geographical forms of Pinus pinaster Soland in Europe and South Africa, with notes on the silviculture of the species, C. E. Duff (*Union So. Africa [Forest Dept. Bul. 22] (1928), pp. 55, pls. 7*).—Many strains differing greatly in character and rate of growth were found in Europe and again in South Africa, where the tree has been introduced and flourishes. The silvicultural requirements of the species are discussed.

Notes on some Australian timbers grown in South Africa, M. H. Scott (*Union So. Africa Forest Dept. Bul. 23 (1928), pp. 52*).—Information is presented upon the seasoning and working qualities of the various woods, their durability, weight, uses, etc.

Field observations and experiments on the pollination of Hevea brasiliensis, L. E. Morris (*Rubber Research Inst. Malaya, Quart. Jour., 1 (1929), No. 1–2, pp. 41–49, pls. 4*).—Male and female flowers are borne in the same Hevea inflorescence, but sex is easily determined by the larger size and terminal position of the female blooms, which are also characterized by a green button-like expansion at the base of the petals. Observations indicated that insects are the carriers of pollen in Hevea and as such are important factors in promoting cross-pollination. Tests on two high yielding clons showed both to be fully self-sterile, not only with pollen of the same tree but also of sister trees. Crossing experiments between trees of these two clons yielded unsatisfactory results, 2 fruits from 143 flowers in one case and 1 fruit from 260 flowers in the other, or only 3 fruits from a total of 403 pollinations. Crosses between certain other clons were more successful, indicating a variability in respect to cross compatibility.

Budding in the field, C. E. T. Mann (*Rubber Research Inst. Malaya, Quart. Jour., 1 (1929), No. 1–2, pp. 50–65, pls. 5*).—Success in budding Hevea was found to be primarily dependent on the growth vigor of the plants at the time of budding. The percentage of success varied directly with vigor of growth during the critical early stage of union of the tissues. Budwood from different clons apparently possess inherently different capacities for successful union. Anatomical studies suggested that differences in structure may account for these varied results. In addition to the condition of the bud and the stock environmental factors, such as water supply and humidity of the air, played an important rôle. One reason for better success in budding in the nursery than in the open field is the more uniform and active growth of the nursery trees.

Vegetative characters and yield of Hevea, A. R. Sanderson and H. Sutcliffe (*Rubber Research Inst. Malaya, Quart. Jour., 1 (1929), No. 1–2, pp. 75–90*).—In an attempt to establish definite correlations between yield and certain vegetative characters in Hevea that might be useful as criteria in selecting high-yielding mother trees, a correlation coefficient of 0.44±0.036 was established between girth at 20 in. and the number of latex vessel rows. This figure is not deemed high enough, however, to be conclusive. The correlation coefficient between yield and girth was 0.52±0.033, but the partial coefficient when the number of latex vessel rows was included was 0.3983, a figure considered too low to justify selection on the basis of girth alone, yet high enough to indicate that large girth is a desirable character. The correlation coefficient between yield and number of latex rows at 20 in. was 0.46±0.036. Of 21 high-yielding trees selected as mothers only two had less than average girth, and only one contained less than the average number of latex vessel rows. With trees tapped in the same manner, 18.8 per cent more latex vessel rows were exposed at 10 in. height than at 20 in.

Chlorophyll in tree leaves, C. G. Deuber, (*Jour. Forestry, 27 (1929), No. 1. pp. 76, 77*).—Data presented on the dry matter and chlorophyll contents of the leaves of some 25 forest, nut, and orchard species growing at North Stamford, Conn., showed a range in chlorophyll content as based on dry leaf weight of from 188.53 mg. per 10 gm. of leaf weight in horse chestnut to 41.27 mg. in white spruce. The material used was the blades of mature typical leaves.

The utilisation and conversion of timber from the point of view of the small landowner, J. H. M. Home (*Highland and Agr. Soc. Scot. Trans., 5 ser., 40 (1928), pp. 23–39*).—Information of a practical character is given on measurement, felling, transportation, sawmills, treatment of various species, and seasoning.

Progress report of the Forest Taxation Inquiry, F. R. Fairchild (*U. S. Dept. Agr., Forest Serv., 1928, pts. 1, pp. [2]+7; 2, pp. 8; 3, pp. [3]+36, pls. 4*).—The first report, Forest Taxation and the Forest Taxation Inquiry, gives a short account of the history, organization, personnel, and plan of operation of the inquiry. The second is an address on Principles of Forest Taxation, by Fairchild, director of the inquiry. The third report, Resources and Tax Base of the Forest Counties of Minnesota, discusses the population, industries, land utilization, timber, and tax base of the forest counties of Minnesota.

DISEASES OF PLANTS

The fungus diseases of cultivated plants, J. Eriksson (*Die Pilzkrankheiten der Kulturgewächse. Stuttgart: Franckh'sche Verlagshdlg., 1926, 2. ed., rev., pt. 1, pp. VIII+300, pls. 3, figs. 151*).—This is the first part (in German) of the second author edition of the book published in Swedish in 1910,[1] which was translated into English in 1912 by Molander (E. S. R., 28, p. 345), into German in 1913 by Grevillius (E. S. R., 30, p. 240), and into French in 1914 by Hagman.[2] The general plan of the first edition has been followed, and information regarding newly discovered diseases, their causes, and their forms has been embodied.

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[1] Landtbruksväxternas Svampsjukdomar, J. Eriksson. Stockholm: C. E. Fritze, 1910, pp. XII+210, figs. 118.

The fungus diseases of garden and park plants, J. Eriksson (*Die Pilzkrankheiten der Garten- und Parkgewächse. Stuttgart: Franckh'sche Verlagshdlg., 1928, pt. 2, pp. 404, figs. 245*).—In this, the second part of the second edition of the work noted above, is given a general review of the more important fungus diseases of garden and park plants of middle and northern Europe, with an account of the appropriate means and methods of prevention and treatment.

Plant pathology (*Arkansas Sta. Bul. 231 (1928), pp. 64–73, figs. 4*).—Brief accounts are given of some of the leading plant diseases investigated at the station.

The relation of soil temperature to the development of cotton wilt, V. H. Young (pp. 64–67).—A summary is given of the results of studies that have been reported in detail (E. S. R., 59, p. 640).

The relationship of different species of pomaceous hosts to the over-wintering of the fire blight germ, H. R. Rosen (pp. 68–70).—In a previous publication Rosen and Groves reported some additional hosts for the fire-blight organism (E. S. R., 60, p. 449). Continued studies are said to have shown the infection of unopen flowers, and the organism is presumed to have gained entrance through the stomata of the petals. Artificial infection was readily secured by spraying pear leaves and blossoms with suspensions of the organisms.

Studies were made of the overwintering of fire blight in apples and pears, and, under the conditions of the experiments, apple trees were found to be carriers of the bacteria. In pruning for the control of fire blight, the author claims that attention should be given to apple as well as to pear trees.

The relation of hold-over cankers on the trunks and larger limbs as sources of primary infection was examined, and three years' observations are said to indicate that such active cankers are rare on apple trees in that region. Fresh infections were traced to blighted small twigs and branches, from which the organisms spread to adjoining sound tissues. If any oozing occurred before newly developed blight, it was found to come from newly infected tissues and not from old cankers.

A consideration of the pathogenicity of the cotton wilt fungus, Fusarium vasinfectum, H. R. Rosen (pp. 70, 71).—In a study of the parasitism of *F. vasinfectum*, it was found that in the presence of large quantities of sodium nitrate and of the fungus cotton seeds were completely inhibited from germinating. The fungus was found to cause primarily a rot of the cortical layer of the roots and lower parts of the stem, entrance being gained through wounds. It was also found capable of destroying many of the feeding roots. Infection experiments are said to have indicated that the organism is more limited in its host range than are some other species of Fusarium. Resistance to wilt on the part of cotton is believed to be due to the ability of readily producing corky and woody tissues about wounds and thus preventing invasion by the fungus.

The etiology of tip and margin burn of Irish potato leaves, H. R. Rosen (pp. 71, 72).—An investigation on the cause of tipburn of potatoes is said to have shown that leafhoppers (*Empoasca fabi*) and not dry, hot weather are the direct cause of the disease. The superiority of the variety Irish Cobbler over Bliss Triumph in producing larger yields is attributed to the relative freedom from tipburn and marginal burning.

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[2] Les Maladies Cryptogamiques des Plantes Agricoles et leur Traitement, J. Eriksson, trans. by S. Hagman. Paris: Libr. Agr. Maison Rustique, 1914, pp. XV+254, pls. 8, figs. 132.

Morphologic variations within a bacterial species with special reference to gonidia formation, H. R. Rosen (pp. 72, 73).—A brief account is given of a study of the rôle of granules found in a spore-forming bacillus obtained in an attempt to isolate an infective agent of potato mosaic. Filtration experiments are said to indicate that the gonidia are produced in the life cycle of the organism, but hanging drop cultures and transplanting studies of single particles gave negative results.

Stem rot of rice, V. H. Young (p. 73).—Stem rot on rice caused by *Sclerotium oryzae* is reported to have appeared on rice plants grown in soil that had been dried out and remained in a dry condition in the laboratory for 18 months.

Division of plant pathology (*Washington Col. Sta. Bul. 229 (1928), pp. 38–41*).—In further investigations of wheat smut control, F. D. Heald and J. Kienholz found that neither formaldehyde dust nor iodine dust gave a satisfactory control. Three different copper carbonate compounds containing from 18 to 20 per cent of metallic copper gave practically as good control as pure copper carbonate. Perfect control was obtained with copper oxalate dust used at the rate of 2 oz. per bushel. The smooth-spored species of smut (*Tilletia levis*) is reported to have gained a fairly wide distribution in the State, and physiological strains of this species, as well as of *T. tritici*, should be taken into consideration in the studies of the resistance of varieties to smut.

Studies by Heald and G. D. Ruehle of apple rots in storage are said to have shown that of the rot-producing fungi only those which cause blue mold and perennial canker are of outstanding importance. To prevent these rots efforts should be made to keep down the spore content of the cleaning solution, thoroughly rinse the fruit with fresh water, and protect it from mechanical injuries. Investigations have shown that complete drying of wet-processed fruit is unnecessary, since apples packed without any drying showed no increase of blue mold decay over dry handling when there was an absence of mechanical injuries. The method of attack by perennial canker and means for its control are said to be unsolved problems, as the absence of mechanical injuries did not prevent infection, and protective treatments did not give control.

Some results are given of investigations by L. E. Miles and L. K. Jones on the control of Rhizoctonia diseases of potatoes, corrosive sublimate and two organic mercury treatments being compared. Corrosive sublimate is said to have reduced the amount of disease in nearly every plat, but neither Semesan Bel nor Dip Dust reduced the disease or increased the yield over the corrosive sublimate treated lots.

The plant disease survey, which is carried on in cooperation with the U. S. Department of Agriculture, has shown that wilt or stem rot (*Sclerotinia trifoliorum*) of alfalfa is increasing in severity. Aster wilt (*Fusarium conglutinans callistephi*) was very severe and caused almost total failure of certain varieties. A smut (*Ustilago bromivora*) was so abundant on the common cheat grass (*Bromus tectorum*) as to lead to inquiries regarding its toxicity to cattle and the possibility of the use of the smut for the control of the spread of the grass. A destructive disease of field peas was reported in eastern Washington, in which both Rhizoctonia and Fusarium appeared to be causally related. The Grand Rapids disease (*Aplanobacter michiganense*) of tomato was found in localities west of the Cascade Mountains, but had not reached the severity recorded for some localities in the eastern United States.

Notes on plant diseases in 1925, H. Wormald (*East Malling [Kent] Research Sta. Ann. Rpt., 13 (1925), pt. 2, pp. 75–86, pls. 3*).—Along with accounts of plant diseases differing as to causation which have been previously announced for Great Britain, record is made, supposedly for the first time, of the occurrence on this area of a leaf blotch (*Sclerotinia cydoniae*) of quince, a leaf disease (*Phyllosticta argyraea*) of *Elaeagnus pungens variegata*, and a bacterial leaf spot (*Pseudomonas juglandis*) of walnut.

Disease and heredity in plants [trans. title], W. Riede (*Centbl. Bakt.* [*etc.*], *2. Abt., 71 (1927), No. 8–14, pp. 272–297*).—Both parasitic and nonparasitic plant disorders are discussed in connection with the principles and the practical phases of plant breeding and disease control.

Bacteriophagy and plant cankers, II [trans. title], W. P. Israilsky (*Centbl. Bakt.* [*etc.*], *2. Abt., 71 (1927), No. 8–14, pp. 302–311*).—In this account, following up the report previously noted (E. S. R., 57, p. 744), particulars and tabulations are given regarding the behavior of a bacteriophage in connection with growths produced by *Bacterium tumefaciens*, both on animals (rabbits) and on plants (beets).

The biology of Cystopus tragopogonis [trans. title], R. Pfister (*Centbl. Bakt.* [*etc.*], *2. Abt., 71 (1927), No. 8–14, pp. 312, 313*).—Infection and other tests are outlined and variant forms of *C. tragopogonis* are described.

A bacterial parasite of Phytophthoras [trans. title], L. Petri (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser., 7 (1927), No. 4, pp. 457–464, figs. 4*).—A study of *Phytophthora* (*Blepharospora*) *cambivora* isolated from chestnut affected with black canker, *P. parasitica* (*P. terrestris*) isolated from lemon, and *P.* (*Pythiacystis*) *citrophthora* isolated from an orange showing root rot was interfered with by the development in and around the hyphae of a bacterium which, in some instances, caused hypertrophy, otherwise variously hindered growth, interfered with the formation of reproductive parts, and finally caused the death of the hyphae. This bacterium is partly described, but not named.

Racial differences and secondary characters in anther smut [trans. title], R. Bauch (*Biol. Zentbl., 47 (1927), No. 6, pp. 370–383, figs. 3*).—Crossings of sections of biologically specialized races of anther smut (*Ustilago violacea*) reveal physiological differences, which are noted, of these specialized races. The results of crossings between other groups are detailed.

Internal therapy in plant pathology [trans. title], L. Petri (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser., 7 (1927), No. 2, pp. 101–120*).—Of the three groups of methods of applying immunizing, therapeutic, or parasiticidal agents to plant tissues from within, namely, the introduction into the ligneous tissue, by penetrating the trunk, of substances in solution or soluble in the sap, the introduction by absorption of solutions through cut ends of roots or branches, and the introduction by absorption through intact roots or branches of solutes, the author considers only the last mentioned as practical. Some early results are noted below.

Effect of manganese sulfate on lemon attacked by Colletotrichum gloeosporioides [trans. title], L. Petri (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser., 7 (1927), No. 2, pp. 213, 214*).—Lemon plants in the eastern part of the Province of Messina, severely attacked by *C. gloeosporioides*, supposedly in consequence of such local factors as adverse soil properties or cultural conditions, were supplied at the roots with manganese sulfate at the rate of 60 gm. per plant. The attack was arrested in a manner that could be definitely connected with the influence of that salt.

Cereal rust control [trans. title], C. Sibilia (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser., 7 (1927), No. 3, pp. 364–366*).—The results of these experiments are said to agree in the main with those obtained by Bailey and Greaney (E. S. R., 58, p. 46).

Root rot of artichoke [trans. title], S. Mercuri (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser., 7 (1927), No. 3, pp. 347–364, figs. 8*).—A root rot of artichoke, *Morphologic variations within a bacterial species with special reference to gonidia formation*, H. R. Rosen (pp. 72, 73).—A brief account is given of a study of the rôle of granules found in a spore-forming bacillus obtained in an attempt to isolate an infective agent of potato mosaic. Filtration experiments are said to indicate that the gonidia are produced in the life cycle of the organism, but hanging drop cultures and transplanting studies of single particles gave negative results.

Stem rot of rice, V. H. Young (p. 73).—Stem rot on rice caused by *Sclerotium oryzae* is reported to have appeared on rice plants grown in soil that had been dried out and remained in a dry condition in the laboratory for 18 months.

Division of plant pathology (*Washington Col. Sta. Bul. 229 (1928), pp. 38–41*).—In further investigations of wheat smut control, F. D. Heald and J. Kienholz found that neither formaldehyde dust nor iodine dust gave a satisfactory control. Three different copper carbonate compounds containing from 18 to 20 per cent of metallic copper gave practically as good control as pure copper carbonate. Perfect control was obtained with copper oxalate dust used at the rate of 2 oz. per bushel. The smooth-spored species of smut (*Tilletia levis*) is reported to have gained a fairly wide distribution in the State, and physiological strains of this species, as well as of *T. tritici*, should be taken into consideration in the studies of the resistance of varieties to smut.

Studies by Heald and G. D. Ruehle of apple rots in storage are said to have shown that of the rot-producing fungi only those which cause blue mold and perennial canker are of outstanding importance. To prevent these rots efforts should be made to keep down the spore content of the cleaning solution, thoroughly rinse the fruit with fresh water, and protect it from mechanical injuries. Investigations have shown that complete drying of wet-processed fruit is unnecessary, since apples packed without any drying showed no increase of blue mold decay over dry handling when there was an absence of mechanical injuries. The method of attack by perennial canker and means for its control are said to be unsolved problems, as the absence of mechanical injuries did not prevent infection, and protective treatments did not give control.

Some results are given of investigations by L. E. Miles and L. K. Jones on the control of Rhizoctonia diseases of potatoes, corrosive sublimate and two organic mercury treatments being compared. Corrosive sublimate is said to have reduced the amount of disease in nearly every plat, but neither Semesan Bel nor Dip Dust reduced the disease or increased the yield over the corrosive sublimate treated lots.

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Root rot of artichoke [trans. title], S. MERCURI (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser., 7 (1927), No. 3, pp. 347–364, figs. 8*).—A root rot of artichoke, dealt with in some detail, is said to be caused by *Rosellinia necatrix*. The effects of several fungicides are indicated.

The root, stalk, and ear rot diseases of maize: Suggestions for their control, H. Wenholz and W. H. Darragh (*Agr. Gaz. N. S. Wales, 38 (1927), No. 1, pp. 39–49, figs. 3*).—Corn root, stalk, and ear rot diseases have greatly increased during recent years throughout New South Wales, and it is thought that these diseases are already present throughout Australia. The yield reduction is due to loss in germination or stand, reduced growth vigor, lodging and breakage, premature ripening of the stalks, and actual injury to the grain.

The diseases are caused by *Fusarium* sp. and *Gibberella* sp., here dealt with as stages of the same organism. Infection methods and disease symptoms are outlined, as are also control measures mentioned as tried or under trial, including seed selection, seed treatment, cultural treatment, and breeding.

On the relation of soil temperature to angular leaf-spot of cotton, R. E. Massey (*Ann. Bot. [London], 41 (1927), No. 163, pp. 497–507*).—Bacterial disease of cotton caused by *Pseudomonas malvacearum* is said to have been first discovered in the Sudan by the author in the season of 1922–23 and to have rapidly gained serious proportions. It is stated that following failure of attempts to control the disease through external disinfection, bacteriological studies were undertaken by R. G. Archibald (E. S. R., 56, p. 846), who discovered the parasite within the cotyledonary tissues of the resting seed. Work was taken up by the present author in 1926 along physiological lines in a search for predisposing causes.

Experiments here detailed have dealt only with the seedling stage, the temperature recorded being that of the soil at 2 in., the depth at which the seeds were planted. Evidence obtained shows that the development of the cotton disease due to *P. malvacearum* during the seedling stage is limited to a definite range of soil temperature. At soil temperatures of 11 to 15° C., infection is slow and may be overlooked in cases of light infection. From 16 to 20° infection is generally successful, but not usually severe under environmental conditions favorable to the seedling. From 21 to 26° infection is severe, but it decreases to 28°, above which point little or no infection occurs, the plant appearing immune at 30°. Experimental evidence suggests that the observed regional distribution of the disease may be explained on these grounds. Some account is given of the internal changes associated with varying temperatures, and indirect support is said to have been given to Faulwetter's data and conclusions (E. S. R., 36, p. 648; 37, p. 49) regarding the spread of the disease in the field by rain.

Cotton diseases of special importance in Tennessee, and their control, C. D. Sherbakoff (*Tennessee Sta. Circ. 24 (1929), pp. 2*).—Anthracnose, angular leaf spot, Fusarium wilt, Verticillium wilt, and rust of cotton are briefly described, and the author calls attention to the desirability of cotton growers planting old seed or 2- or 3-year-old seed delinted with sulfuric acid for the control of anthracnose and angular leaf spot, the use of wilt-resistant varieties for avoiding Fusarium wilt, the use of disease-free seed, etc.

A wilt disease of hops, R. V. Harris (*East Malling [Kent] Research Sta. Ann. Rpt., 13 (1925), pt. 2, pp. 92, 93*).—A brief account is given regarding a disease of hop noted in 1924 and 1925, with a statement regarding differences between the symptoms of this disease and those of hop canker. The constant association of a Verticillium with the disease and the supporting facts of symptom similarity suggest strongly that this organism is the cause of the trouble.

Degeneration diseases of the Irish potato in Mississippi, H. H. Wedgworth (*Mississippi Sta. Bul. 258 (1928), pp. 11, figs. 7*).—The author describes mosaic, leaf roll, and spindle tuber, all of which cause degeneration of potatoes; gives an account of the effect of some of the diseases on the yield of potatoes; and suggests methods for the control of these infections. The control is based primarily on the use of disease-free seed from regions adapted to the production of potato seed.

[Potato necrosis] (*Washington Col. Sta. Bul. 229 (1928), p. 57*).—A brief report is given of investigations by H. Jensen, in which Irish Cobbler potatoes were subjected to varying temperatures and to varying times of exposures at harvest time to determine the extent of heat necrosis resulting from such exposure. It was found that an air temperature of 95° F. or above may be dangerous to potatoes left exposed for more than half an hour after digging. Tubers that had been exposed to 95° or more for 2 or 3 hours, although apparently uninjured if examined immediately, are said to have shown from 50 to 80 per cent breakdown and decay within 48 hours.

The production of the resting-spores of Phytophthora infestans on potato tubers, P. A. Murphy (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1927), No. 34, pp. 407–412, pl. 1*).—Work was reported by Pethybridge and Murphy (E. S. R., 29, p. 846) in 1913 and by others, regarding the production by *P. infestans* of more or less perfect sexual organs and oospores on artificial media, and a reference published in 1921 on the finding of such organs and spores on the natural host is credited to Pethybridge (E. S. R., 49, p. 751). The present paper records the finding of sexual organs on potato tubers under a variety of conditions. It is stated that occasionally a perfect set of organs, consisting of oogonium, antheridium, and oospores, was produced. Oogonia and parthenogenetic spores were subsequently found on the surface of a cut tuber in the soil, which is considered as the natural place of their formation.

Some further cases of the production of diseased shoots by potato tubers attacked by Phytophthora infestans, and a demonstration of alternative sources of foliage and tuber infection, P. A. Murphy and R. M'Kay (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1927), No. 35, pp. 413–422, pl. 1*).—Though *P. infestans* appears each year on the aerial parts of the potato plant, just how it travels from the tuber, in which it hibernates, to the foliage is considered as not yet fully settled. It is said to have been shown by A. de Bary in 1876 that the sprouts from infected tubers may survive to reach the surface, where conidia are produced which spread the disease. It is claimed that this, the only proved method by which the disease starts aerially, had been observed by only four investigators since de Bary up to the time of the appearance of the present paper. This records another case of blight appearing primarily on the surfaces of shoots from two naturally infected tubers, which just survived to come above the ground under open field conditions in 1926. In the laboratory at 25° C. this phenomenon was produced practically at will.

Attention is called to the fact that the soil immediately surrounding a diseased tuber usually becomes highly contaminated with mycelium and conidia, whether or not diseased shoots reach the soil surface. The infection of tubers of the new crop, either from the parent or from the soil, is claimed to have been demonstrated. The possibility of hibernation in the soil is considered, and the production under natural conditions of sexual organs (generally only oogonia, which are mainly abortive but which may contain spores) is referred to.

In the laboratory below 25° the fungus was directly observed in many cases to penetrate the sprouts (which did not reach the surface) and to spread into the adjacent soil, where its pathogenicity was retained for a limited time, in one case for as much as 57 days. Just how such infecting material reaches the surface from deep-lying tubers in the field is not yet known.

The emergence from blighted tubers of the fly *Sciara* sp. carrying conidia of *P. infestans* has been demonstrated under laboratory conditions, as has been also the infection of a tuber of the new crop produced by a plant from a blighted tuber in the absence of foliage infection.

The relative importance is discussed of such factors in causing primary foliage infection as the emergence of diseased shoots, the production of infecting material in the soil near blighted tubers, the possible hibernation of the fungus in open soil, and resting spores, which are claimed to occur occasionally on blighted tubers under natural conditions.

A study of the causes of chlorosis in rice, W. H. Metzger and G. Janssen (*Arkansas Sta. Bul. 231 (1928), p. 31*).—From a study of rice chlorosis, the authors claim that it is not a matter of availability of iron which causes chlorosis in rice plants grown on soils treated with sodium nitrate but rather a lack of available nitrogen after nitrates have been reduced. Total nitrogen studies are said to have shown that a very large portion of the nitrogen in nitrates is lost when nitrates are reduced in flooded soil.

Microcera coccophila, A. Pulselli (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 7 (1927), No. 3, pp. 300–329, figs. 13*).—A somewhat general preliminary study of *M. coccophila* instances a notable variability in a fungus on artificial media.

Nematode infestation and crop rotation, S. Freed (*Facts About Sugar, 23 (1928), No. 51, p. 1211*).—Data which are tabulated as said to have been compiled by A. C. Maxson are said to indicate that the best method of beet-nematode control is crop rotation, consisting of a succession of nonhost crops for at least four seasons before again planting beets on land when once found to be infested. It is claimed that the adoption of a practical rotation with the resulting control of the beet nematode will not only prevent great yield reduction in a field of beets but will actually increase the returns from all crops grown on the farm.

A new disease of sugar cane [trans. title], R. Azzi (*Bol. Agr. [Sao Paulo], 28. ser., 1927, No. 9–10, pp. 526–532, figs. 4*).—In June, 1926, the author observed a leaf discoloration of sugar cane, which is described as appearing in all cane varieties commonly cultivated in different places named as visited. An organism which was found is briefly discussed.

White tobacco [trans. title], J. Dufrenoy (*Min. Agr. [France], Ann. Épiphyties, 13 (1927), No. 1, pp. 43–47, pls. 4, figs. 13*).—White tobacco, so-called, is evidence of the abundant accumulation of starch in the chloroplasts. This foliar excess of starch is considered to reveal a failure of the normal migration of carbohydrates from their place of (synthetic) origin to the growing regions, and to result from a lack of development of the roots and of the stalk wood, or more directly from a consequent deficiency of mineral nutrition.

The utilization of foliar starch may be brought about by the removal of the plants from the light. The leaves then become emptied of their starch and assume the appearance of healthy leaves. They can then be dried without becoming moldy.

A tomato disease in the Province of Salerno [trans. title], F. Sansone (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 7 (1927), No. 4, pp. 465–484, figs. 4*).—A tomato stem softening is described, with an account of the presence or development of fungus material and with references to contributions by other authors.

Spotted wilt of tomatoes, H. A. Pittman (*Jour. Council Sci. and Indus. Research [Aust.], 1 (1927), No. 2, pp. 74–77, pl. 1*).—This preliminary note states that in the investigation of the spotted wilt tomato disease, which is being carried out at the Waite Agricultural Research Institute in cooperation with the Council for Scientific and Industrial Research, it has become possible to determine with reasonable assurance that the disease is due to a virus and that it is transmitted by an insect (*Thrips tabaci*). Under natural conditions, it is, supposedly, the winged adults only which carry the disease from plant to plant. The causal organism, however, has not been determined. It is thought that the disappearance of the insects from the plants, in most cases long before the symptoms of the disease become evident, may explain the fact that their relation to the spotted wilt disease had not previously been suspected.

Hypertrophy of cortical parenchyma in nodes of Triticum (trans. title], C. SIBILIA (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 7 (1927), No. 3, pp. 297–300, fig. 1*).—The author notes the occurrence in wheat stem nodes of a hypertrophied condition of the subepidermal parenchyma, supposedly in relation to conditions and changes described as regards precipitation. This hypertrophy is said to resemble considerably the condition indicated by Küster (E. S. R., 36, p. 46) under the name of intumescence.

The incidence of "die back" disease in plum trees, J. AMOS, R. G. HATTON, and A. D. MACKENZIE (*East Malling [Kent] Research Sta. Ann. Rpt., 13 (1925), pt. 2, pp. 33–37*).—A somewhat detailed account is given regarding the outbreak and varietal incidence on station plats of a die-back of plum trees declared to show symptoms identical with those described by Cayley (E. S. R., 52, p. 149.)

Action of some poisonous compounds on olive fumagine [trans. title], G. K. FILIPPOPULOS (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 7 (1927), No. 3, pp. 330–346, figs. 4*).—A brief systematic discussion is presented regarding organisms which have been found in association with the condition known as fumagine in olive, with compositions and proportions of preparations claimed as protective.

[**Citrus canker in Florida**] (*Fla. State Plant Bd. Mo. Bul., 12 (1927), No. 6, pp. 130, 131, 133, 134*).—In detached accounts brief details are given of the discovery of citrus canker on 85 grove trees on 2 properties near Fort Lauderdale in November, 1927, and the department of citrus canker eradication tabulates quantitatively the history of this disease in Florida during the period from May, 1914, to November, 1927, inclusive. To November, 1927, no canker was seen in Florida after December, 1926, none before that month after March, 1925, and none before that after October, 1923. The period from September, 1920, to April, 1922, was also reported as free from the disease.

Lemon anthracnose [trans. title], L. PETRI (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 7 (1927), No. 3, pp. 229–284, figs. 16*).—Lemon anthracnose in the Province of Messina is due directly to the parasitic action of *Colletotrichum gloeosporioides*. The serious chronic effects noted are ascribed to the progressive advance of the mycelium in the vessels of the branches and trunk. The high virulence of the attacks in this Province is believed to depend upon local conditions unfavorable to vigorous health of the trees.

Cultural studies have shown that the conidial form met with in nature appertains to an ascospore form referable to Glomerella.

[**Coconut diseases**], S. R. VANDENBERG (*Guam Sta. Rpt. 1927, pp. 12–14*).—Coconut bud rot, caused by *Phytophthora faberi*, is said to be under control in Guam.

A fire blight of young and seedling coconut trees resembling coconut bud rot to some extent is briefly described. This disease is said to be associated with the burning of weeds and trash among the trees. Some of the affected coconut trees were apparently restored to normal condition by flooding them with salt water of approximately the same degree of salinity as sea water. Sea water has also been found very effective in destroying several insects when applied partly as a drench and partly as a spray.

In connection with studies of bud rot, evidence was secured that indicated that bacteria could not attack vigorously growing trees except through injuries to the bud growth. Insect attack, mechanical injury, and excessive heat were found to produce injuries that are followed by a bacterial rot of the palms. This disease differs from the true bud rot in a number of characters, and it is said to be usually a dry season disease, whereas the Phytophthora rot occurs during a wet season.

A physiological disease of coconut palms is briefly described. The first symptoms of this disease are the withering and hanging down of the lower leaves, followed by a gradual diminution in the diameter of the trunk, with a corresponding decrease in the size of the top and consequently in the number and size of the nuts produced. Later no flower bracts are put out, and the top is reduced to only two or three stunted leaves at the top of the trunk, which is reduced to a diameter of only 2 or 3 in. This condition is said to continue until the top dies or is blown off.

Coconut bud rot in Florida, J. L. Seal (*Florida Sta. Bul. 199 (1928), pp. 87, figs. 51*).—The results are given of an investigation of coconut bud rot as it occurs in Florida. Bud rot, caused by a species of Phytophthora, was first reported in the vicinity of Miami in January, 1924. Since that date the infested area has been traced for 140 miles along the southeastern coast of the State. In attempting to control the disease, 75,000 bud-rotted plants have been destroyed.

Several species of Phytophthora have been described by different authors as the causative agents of coconut bud rot, and the present author has compared strains of Phytophthora isolated from bud-rotted palms in Florida with *P. terrestris*, *P. faberi*, and *P. palmivora*. Based on their morphological, physiological, and pathological characters, the author is led to agree with Leonian (E. S. R., 54, p. 745) in placing all the strains in the group species *P. omnivora*.

It is claimed that coconut bud rot may appear at any time of the year, but is found more commonly a month or two after periods of heavy rains. The disease is said to take its greatest toll of plants in nurseries, particularly those located on low peat soils. The control of the disease has been effected by the use of local quarantines, destruction of diseased plants, and the protection of the healthy plants by the use of Bordeaux mixture and fish-oil soap.

[Diseases of the oil palm in Malaya], B. Bunting, B. J. Eaton, and C. D. V. Georgi (*Malayan Agr. Jour., 15 (1927), No. 9–10, pp. 334–337, pl. 1*).—Oil palm bud rot is a term which is now known to have included a number of different diseases, though this trouble has not yet become very serious in Malaya. Crown disease affecting palms, usually under two years of age, is described. The causation of this disease, which has been regarded as an incipient form of bud rot, is still somewhat obscure, neither fungi nor bacteria having been demonstrated in the recently affected tissues. A Marasmius disease of fruit bunches is described. An agaric appeared to cause disintegration in nonpollinated fruits of 5-year-old palms. A Fusarium frequently plays an important part in disintegrating the male inflorescene. Attention is called to a premature ripening and hardening of the individual fruits, also to a soft, slimy condition, apparently bacterial, of the individual fruits.

Sterility caused by the aster yellows disease, L. O. Kunkel (*Mem. Hort. Soc. New York, 3 (1927), pp. 243, 244, pl. 1*).—Studies have been carried out on yellows of asters during three years. It is stated that plants which contracted yellows while young (rosette stage) did not produce seeds or even flowers, though some plants which contracted yellows when somewhat older blossomed and even produced seeds. In such cases, however, the blossoms are abnormal in ways which are described. The degree of severity of yellows depends on the youth of the plant at the time of infection. In some cases only one side, or a few branches, may be diseased at the time it blossoms, in which case the healthy parts produce normal flowers and viable seeds, while seeds produced by diseased branches or on diseased portions of individual flower heads are sterile. Diseased plants do not always produce seeds even when they bear flowers. The flowers may develop into vegetative branches or may produce secondary flowers or even flower heads on their stigmas. The stigmas of secondary flowers may also develop into flowers or flower heads. It is not uncommon, therefore, to find diseased flowers borne in short chains. This abnormal development is associated with yellows on asters, phlox, mignonette, and many other plants.

Aster yellows furnishes an excellent example of sterility due to a transmissible disease. Virus-bearing individuals of *Cicadula sexnotata* feeding on healthy aster plants are able to transmit some agent which prevent the plants from producing normal flowers or viable seeds. This kind of sterility is supposedly associated with several of the different yellows diseases which attack plants.

A disease of the Shasta daisy, H. Wormald (*East Malling* [*Kent*] *Research Sta. Ann. Rpt., 13 (1925), pt. 2, pp. 96, 97, pl. 1*).—Referring to his previous account (E. S. R., 58, p. 659) of the appearance in Britain of *Septoria leucanthemi* on the Shasta daisy, the author now notes a statement by J. Staley claiming to have found a Septoria disease on one of the *Chrysanthemum maximum* varieties in September, 1915, also an examination of material sent by Staley showing the same symptoms and organism. The disease occurred in 1925 at Bearsted, Kent, and at Hayling Island, Hampshire.

Root diseases of narcissus and hyacinths cured by soil disinfection [trans. title], F. C. Gerretsen, D. J. Hissink, K. Volkersz, and K. Zijlstra (*Dept. Binnenland. Zaken en Landb.* [*Netherlands*], *Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefsta., No. 32 (1927), pp. 302–384, pls. 24, figs. 4; Eng. abs., pp. 376–378*).—For about 10 years Dutch bulb growers have experienced losses from certain areas on which narcissus died earlier and gave lower crops than elsewhere. Hyacinths (especially those having fine roots) are also susceptible, though tulips are immune. The roots show brown spots, at first small, but these afterwards enlarge until the root system is in the main destroyed. The bulb remains healthy, however, and the trouble is, therefore, thought to lie in the soil.

The center of a spot consists of dead cells having cork walls and often containing a fungus in various stages of development. Heat sterilization of the soil gave healthy bulbs, and partial sterilization with formalin had a like result.

In a study of disinfectants, 0.5 per cent formalin was found to kill 98.3 per cent of the soil bacteria within 20 hours. This disinfectant greatly increased yields, showing for both narcissus and hyacinth a very marked effect, even in the following year. It was found to spread more deeply and rapidly through the soil, and to be equally effective with one-third the formalin if water was introduced some hours after the formalin.

Carbon disulfide, even in low concentrations, proved to be deeply penetrative and very active, nearly equaling formalin in this respect. After 20 hours at a depth of about 0.5 meter, 77.7 per cent of the bacteria and 73.8 per cent of the fungi were dead.

Caporite ($CaOCl_2$), carbolineum, $CaCl_2$, Uspulun, and sulfur gave unsatisfactory results.

A fungus parasitic on an orchid [trans. title], C. Sibilia (*Bol. R. Staz. Patol. Veg.* [*Rome*], *n. ser., 7 (1927), No. 4, pp. 412–435, figs. 8*).—An investigation of a leaf brown spot of the orchid Laelia-Cattleya has resulted in the separation and study of a Diplodia which is claimed to belong to the section Nematodiplodia (as opposed to Eudiplodia), and which is diagnosed as a new species under the name *D. laelia-cattleyae.*

Recent progress in knowledge of the life history of forest fungi [trans. title], E. MÜNCH (*Ztschr. Pilzk., 6 (1927), No. 2, pp. 17–21*).—This is largely a review and summary of recent contributions by Melin, some of which have been noted (E. S. R., 55, pp. 350, 351; 57, p. 219).

A pine cone failure [trans. title], C. SIBILIA (*Bol. R. Staz. Patol. Veg. [Rome], n. ser., 7 (1927), No. 4, pp. 454–457*).—In 1926, cultivated pines showed alterations in the cones and the contained seeds, which are described and attributed to an Alternaria of the type *A. tenuis.* Apparently two forms are present, which differ as to certain conidial characters and which are described.

Ustulina zonata, (Lev.) Sacc.—a warning note, F. W. SOUTH (*Malayan Agr. Jour., 15 (1927), No. 12, pp. 446, 447*).—Attention is called to the prevalence of the dry-rot fungus (*U. zonata*) on the stems and main branches of rubber trees, especially in the coastal districts of Selangor, also to the advice consistently given by the local department of agriculture as to the importance of burning quickly all felled trees and all large pruned branches, and to the need for care in pruning so as not to expose large torn or barked areas.

Fiji disease in the Maryborough district, E. J. F. WOOD (*Queensland Agr. Jour., 27 (1927), No. 5, pp. 388–393, pl. 1, figs. 4*).—The cause of Fiji disease, regarded as one of the most serious cane diseases of Queensland, is deemed at present only conjectural. It is transmitted in cuttings, in some cases by insects, but probably not in soil nor on cane knives so far as known. The spread is rapid. So far as known at the date of this statement, it is confined to the Beenleigh and Maryborough districts, the known and suspected areas being indicated. The effects on the plant are described, the leaves being shortened, darkened, bunched, twisted, and lumped or galled on the lower surface, and the stool and the ratoon usually dwarfed or static. Varieties tentatively looked to for resistance include Q. 813, H. Q. 285, and Petite Senneville.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The fur animals of Louisiana, S. C. ARTHUR (*La. Dept. Conserv. Bul. 18 (1928), pp. 433, figs. 216*).—This report is based upon work by the director of the division of wild life, Department of Conservation, of Louisiana, in which State the annual fur crop is valued at $6,000,000 or more. In considering the fur animals, particular attention is given to the muskrat (pp. 187–278). A chapter on the alligator is included (pp. 165–186). The several accounts of these animals are followed by the field biologist's report and chapters on ranching; fur farming of muskrats; trapping methods; ecology of the Louisiana muskrat lands; the different muskrat furs; grading fur pelts; and skinning, curing, and shipping furs. The appendix includes articles on comparative takes of fur animals and on fur production of Canada, a list of references, and a systematic list of Louisiana fur animals.

Observations on rodents and their parasites, J. W. FIELDING (*Roy. Soc. N. S. Wales, Jour. and Proc., 61 (1927), pp. 115–134*).—This is a contribution from the Australian Institute of Tropical Medicine, Townsville, Queensland.

Social parasitism in birds, H. FRIEDMANN (*Quart. Rev. Biol., 3 (1928), No. 4, pp. 554–569*).—A digest of the literature on this subject in connection with a list of 50 references.

Birds as hosts for the common chigger, H. E. Ewing (*Amer. Nat., 63 (1929), No. 684, pp. 94–96*).—In collections made along the Atlantic coast in Virginia and North Carolina in July, 1928, 83 birds representing 34 species were taken, most of which were small land birds. Seven of the species were found to act as chigger hosts. A list is given with the number of chiggers collected.

It is concluded that in many localities ground-frequenting birds are of more importance as hosts for chiggers than either the rabbit or box turtle, although the rabbit, of all wild mammals, and the box turtle, of all reptiles, appear to be important hosts of chiggers.

Control of the Kalutara snail, H. W. R. Bertrand (*Trop. Agr. [Ceylon], 71 (1928), No. 3, pp. 151, 152*).—This is an account of means of control for *Achatina fulica*, introduced from Madagascar into Ceylon, where it has spread over the whole of the wet zone low country and is now spreading into many up-country districts.

A bibliography of biographies of entomologists, with special reference to North American workers, J. S. Wade (*Ann. Ent. Soc. Amer., 21 (1928), No. 3, pp. 489–520*).—The author here presents in alphabetical order a list of references to some of the more readily available biographical sketches of entomological workers, exclusive of those now living.

The physiology of insects: Metabolism, P. S. Welch (*Ann. Ent. Soc. Amer., 21 (1928), No. 3, pp. 476–488*).—This account includes a bibliography of 54 titles.

Response and adaptation of insects to external stimuli, W. Robinson (*Ann. Ent. Soc. Amer., 21 (1928), No. 3, pp. 407–417, figs. 5*).—The influence of the colloids present in the tissues upon the physiology of response and adjustment is here considered, and experiments are reported in which there appears to be a definite colloidal response to conditions of temperature and moisture.

The preservation of immature insects, E. G. Kelsheimer (*Ann. Ent. Soc. Amer., 21 (1928), No. 3, pp. 436–444*).—This is a contribution from the Ohio Experiment Station.

Evaluation of insecticides, C. H. Peet (*Indus. and Engin. Chem., 20 (1928), No. 11, pp. 1164, 1165*).—The author reports upon tests considered to be of value in providing a workable basis for establishing comparisons.

English-grown pyrethrum as an insecticide, I, J. C. F. Fryer, F. Tattersfield, and C. T. Gimingham (*Ann. Appl. Biol., 15 (1928), No. 3, pp. 423–445*).—An account is given of studies of the toxicity to *Aphis rumicis* L. and to certain caterpillars of spray fluids prepared from samples of pyrethrum grown in England from Swiss and Japanese seed.

"Pyrethrum flowers grown in six different localities showed only slight differences, and for practical purposes all the samples had approximately the same toxicity. They did not differ in this respect significantly from a sample grown on the continent. The toxicities of extracts of equal weights of pyrethrum flowers tested at different stages of development differed very little. Artificial drying of the flowers had no significant effect on the toxic properties. The flowers were about ten times as toxic as the stalks, weight for weight. Prolonged exposure of pyrethrum to wet conditions led to some loss of toxicity, but contrary to the usual opinion, if stored in a reasonable manner it remained for long periods without deterioration. Caterpillars of different species showed marked differences in susceptibility to the action of pyrethrum. The biological method has proved suitable for evaluating samples of pyrethrum."

Petroleum oil as a carrier for insecticides and as a plant stimulant, E. R. de Ong (*Indus. and Engin. Chem., 20 (1928), No. 8, pp. 826, 827*).—This account is based upon investigations noted from another source (E. S. R., 57, p. 258; 59, p. 759; 60, pp. 162, 453).

Laboratory experiments with non-arsenical insecticides for biting insects, C. T. Gimingham and F. R. Tattersfield (*Ann. Appl. Biol., 15 (1928), No. 4, pp. 649–658, pl. 1*).—The author describes a convenient technique for insecticidal work with biting insects. "The silicofluorides of sodium, potassium, aluminum, and calcium, used in the form of spray fluids, showed considerable toxicity to young larvae of several species of moths. The degree of resistance varies with different species and is greater with older larvae. Considerable but irregular injury to foliage was noted, and much further work is required to establish the conditions under which these compounds could be safely used. Foliage sprayed with extracts of certain tropical plants is extremely repellent to young larvae. Even with high dilutions of the extracts, the foliage remained uneaten and the larvae eventually died of starvation."

The account includes a brief review of some recent work on laboratory experiments with nonarsenical insecticides for biting insects.

Insecticidal action of some esters of halogenated fatty acids in the vapor phase, R. C. Roark and R. T. Cotton (*Indus. and Engin. Chem., 20 (1928), No. 5, pp. 512–514*).—The authors find that "from the standpoints of toxicity to insects, availability, cost, and freedom from fire hazard, methyl, isopropyl, and ethyl monochloroacetates appear to be the most promising of the lower alkyl esters of chloroformic (chlorocarbonic), monochloro-, dichloro-, and trichloroacetic, monobromoacetic, α-bromo- and β-bromopropionic, and β-chloropropionic acids tested. Dosages of 1 lb. of methyl monochloroacetate, 1.5 lbs. of isopropyl monochloroacetate, and 2 lbs. of ethyl monochloroacetate per 100 cu. ft. are effective against stored-product insects in fumigation vaults of the commercial type. Unfortunately, the monochloroacetates injure the germination of wheat; hence, they do not look promising for the fumigation of grain intended for seed."

Further fumigation tests with ethylene dichloride-carbon tetrachloride mixture, L. F. Hoyt (*Indus. and Engin. Chem., 20 (1928), No. 9, pp. 931, 932, figs. 2*).—This is a report of experiments (E. S. R., 59, p. 650) conducted with Tribolium in flour and the Indian meal moth in cereals. Flour infested with the confused flour beetle (*T. confusum*) was confined in a small cloth sack and buried in a one-eighth tied paper sack of flour. When examined within 1 hour after fumigation the 26 adult beetles and 5 larvae confined in the infested flour were all dead. No reinfestation of this fumigated sample of flour occurred during the 2 months following the fumigation. The 24 full-grown larvae and 2 moths of the Indian meal moth that had been confined in a small carton of rolled oats, sealed and tightly wrapped, were all dead within 1 hour after fumigation. The fumigant apparently had no injurious effect upon the flour and no odor could be detected in the hot loaf when broken open, this being the most severe test.

The experiments in which moth-infested rugs and furniture were fumigated in a 7,800 cu. ft. room were found to be 100 per cent effective.

Ethylene oxide as a fumigant, R. T. Cotton and R. C. Roark (*Indus. and Engin. Chem., 20 (1928), No. 8, p. 805*).—The data presented indicate that the vapors of ethylene oxide are somewhat more toxic to stored-product insects than are those of carbon disulfide and about thirty times as toxic as those of carbon tetrachloride.

Miscible carbon disulfide, W. E. Fleming and R. Wagner (*Indus. and Engin. Chem., 20 (1928), No. 8, pp. 849–851*).—This contribution from the Japanese Beetle Laboratory, Bureau of Entomology, U. S. D. A., describes a miscible carbon disulfide which has been perfected and is equally as effective as emulsions of this compound in destroying the soil-infesting stages of the beetle.

It is no more injurious to plants, and in addition has certain physical and chemical advantages.

Fumigation with cyanogen products, C. V. AKIN and G. C. SHERRARD (*Pub. Health Rpts. [U. S.], 43 (1928), No. 41, pp. 2647–2670*).—This is a report of experiments conducted with cyanogen products in the fumigation of vessels for quarantine purposes at the New York Quarantine Station, Rosebank, Staten Island, N. Y.

[Work with economic insects at the Arkansas Station] (*Arkansas Sta. Bul. 231 (1928), pp. 47–49*).—Work with the southern corn rootworm is reported upon by D. Isely. It is pointed out that as preventive measures the bottom land that is to be planted in corn should be kept free from wild grasses a month before planting to avoid infestation, and that fields susceptible to rootworm damage should not be planted to corn until June 1.

A brief reference is made to the cotton boll weevil by the same author, who points out that there is a definite relationship between the abundance of squares in a field late in the season and the presence of overwintered weevil in that field the following spring.

Brief notes are made by W. J. Baerg on the rough-headed cornstalk beetle (*Euthcola rugiceps*).

Insect investigations (*Maryland Sta. Bul. 298 (1928), pp. 177–198*).—This consists of a collection of some of the minor investigations conducted by the station that have never been published.

Observations on the oriental fruit moth (*Laspeyresia molesta* Busck) (pp. 179, 180), the rosy apple aphid (pp. 180, 181), and control experiments on the oyster-shell scale (pp. 186, 187) are recorded by H. S. McConnell. In the course of 3 years' observations of *L. molesta* particular attention was paid to parasitic enemies and attacks on apples late in the season. *Macrocentrus ancylivora* Roh. was found to be the principal parasite of this pest in the State, although *Trichogramma minutum* Riley is an important parasite of the egg, especially late in the season. In the western part of the State, *Glypta rufiscutellaris* Cress and *Epiurus indagator* Cress have been recovered in larger numbers than any other species, both having been reared from overwintering larvae of *L. molesta* and observed in limited numbers throughout the season. *Microbracon gelechiae* was recovered in considerable numbers late in the season of 1925. Reference is made to an attack on the apple by *L. molesta* in the fall of 1926, an account of which has been noted (E. S. R., 57, p. 455). Of the worms found in the apples 69 per cent were oriental fruit moth larvae and 31 per cent codling moth larvae, while in 1927 60 per cent of the larvae represented the oriental fruit moth and 40 per cent the codling moth.

The notes on the rosy apple aphid relate to its life history, 15 generations having been reared under screen cage conditions in the summer of 1927. Control work with the oyster-shell scale led to the recommendation that for the first generation a 2 per cent white oil emulsion be used the first week of May, or soon after the eggs are observed to be hatching, and that a second application be made 3 weeks later. A 2 per cent white oil emulsion should be applied the third week in July, or when the second generation eggs are observed to be hatching, followed by a second application of the same strength of oil 3 weeks later.

Studies of the plum curculio (pp. 181–184), control experiments on euonymus scale (pp. 187, 188), and control of bees burrowing in lawns (pp. 196, 197) are reported by P. D. Sanders. Cage studies of the plum curculio during the summer of 1923 showed that only one brood occurred that year. Field observations during the four years following failed to reveal a destructive second brood.

The curculio is present and feeding in the orchard when apple trees are in bloom and when the peach petals have fallen. The control work with the euonymus scale extending over one year, in which Sunoco oil, 1 gal. to 20 gal. of water, was applied as a late dormant spray, indicates that good control can be had where a thorough application is made. A 2 per cent actual oil spray made from Volck shows great promise as a summer control of this scale. In control work with bees on lawns, the solitary bee *Andrena prelexa* Smith was found capable of destroying grass on lawns as a result of the digging of nests by the females in the soil. It was found that a carbon disulfide emulsion used at the rate of 1 gal. to 200 gal. of water and applied at the rate of 1 pint to each square foot of surface gives complete control.

Experiments with pine oil preparations (pp. 184–186), the control of the iris borer (p. 186), the effectiveness of several grades of carbon disulfide (pp. 192–195), and the protection of cattle from flies (pp. 195, 196) are reported upon by E. N. Cory. Work with pine oils, both impregnated with paradichlorobenzene and alone, indicates that the materials have great promise in use against the peach tree borers. The use of carbon disulfide emulsion at the strength recommended for the control of the Japanese beetle was found to destroy the iris borer quite effectively at nurseries where work was conducted. It is pointed out that an application while the insect is in the larval stage, about the last week in July, is probably the best time for soil treatment at College Park. In work with carbon disulfide no consistently better results were obtained from the several grades of commercial brands than from the chemically pure material. A brief account is given of the work of protecting cattle from flies in continuation of that previously noted (E. S. R., 37, p. 260).

A further report (E. S. R., 56, p. 360) of observations of the potato tuber moth (pp. 189–192), by P. X. Peltier, deals with the history of the infestation, life history and control, and climatic relations. A summary of a dissertation by P. Knight on the head capsule of the soldier termite is appended (p. 198).

[Economic insects and their control in New York] (*N. Y. State Hort. Soc. Proc., 73 (1928), pp. 6–30, 183–195, 225, 226*).—Papers presented at the annual meeting of the New York State Horticultural Society (E. S. R., 57, p. 853) held at Rochester and Poughkeepsie, N. Y., in January and February, 1928, include the following: The Apple Aphids in Relation to Profitable Spray Practices, by P. J. Parrott (pp. 6–14, 225, 226); Report of the Committee on Entomology, by E. P. Felt (pp. 15–21); Use of Oils for Pear Psylla Control, by F. Z. Hartzell (pp. 22–30); Bordo-oil and Other Sprays on Apples in 1927, by E. V. Shear, jr. (pp. 183–188); and Results of Some Investigations in Insect Control in the Hudson Valley, by F. G. Mundinger (pp. 189–195).

[Report of the division of entomology of the Washington Station] (*Washington Col. Sta. Bul. 229 (1928), pp. 27–29*).—Reference is made to soil treatment for subterranean insects, particularly potato flea beetles, by R. L. Webster and W. W. Baker. Dusting the foliage with various combinations of lead arsenate, calcium arsenate, sodium fluoride, and sodium fluosilicate mixed with lime and sulfur and with lime alone gave some protection, but in no case was a satisfactory degree of freedom from injury to tubers obtained. Excellent results were obtained with 2 per cent nicotine dusts, but the high cost of some of these treatments prevent their use except for checking the influx of beetles at the edges of potato fields early in the season.

In further control work by A. Spuler with the San Jose scale, in which several types of lubricating oils, emulsions, and emulsifiers were tested, no difference was detected, all being superior to lime sulfur and giving practically 100 per cent control.

The application of oils for codling moth control at Wenatchee in 1926 and 1927, by Spuler, indicated that as many as three lead arsenate sprays could be eliminated by substituting oils, with results comparable to five applications of lead arsenate. In all cases where oils were used in the orchard, however, the trees showed a disturbance which was reflected in the lighter color of the foliage and also in the smaller size of the fruit.

Experimental work in codling moth control, in which various insecticides were being tested, was continued in 1927, the same orchard at Wenatchee being utilized. A severe codling moth infestation was checked the first year by heavy application of lead arsenate sprays during the season, although a large percentage of "stings" in the apples resulted where small larvae were poisoned on their way into the fruit. Standard strength lead arsenate (2 lbs. to 100 gals.) reduced this heavy infestation to 7.9 per cent of worms, but the percentage of worms and stings together ran up to 56.9 per cent. Double strength lead arsenate (4 lbs. to 100 gals.) cut this down to 42.8 per cent of worms and stings. In 1927 the single strength lead arsenate reduced the total for worms and stings to 8 6 per cent, while the double strength reduced it to 3.7, but the gain due to the increase in lead arsenate dosage was scarcely worth while, the greater amount of arsenical residue rendering the value of the double strength questionable. Other arsenicals, including manganese arsenate, calcium arsenate, and magnesium arsenate, were tested in 1927, none of which gave as high an efficiency as lead arsenate when used alone. In the 1927 experiments it was found that nicotine sulfate (1:600) could be used as a substitute for lead arsenate in the second and third cover sprays, although this combination was somewhat less effective. The indications are to the effect that some combination of nicotine sulfate may be of value in reducing arsenical residue and still serve to keep the codling moth well in check.

The value of the codling moth traps in timing spray dates, first suggested by the station in 1926, was further emphasized in 1927, when it was found that differences in exposure, elevation, and altitude in orchards in the Wenatchee Valley made little difference in the time of emergence of the moths during the season.

Fifty-eighth annual report of the Entomological Society of Ontario, 1927 (*Ent. Soc. Ontario Ann. Rpt., 58 (1927), pp. 107, figs. 16*).—The papers presented at the annual meeting of this society in 1927 (E. S. R., 58, p. 158) include the following: Some Observations on Nicotine Dust, by R. Glendenning (pp. 25–27); A Preliminary Report on Some of the Bud-moths and Leaf Rollers of Nova Scotia, by F. C. Gilliatt (pp. 27–39); The Mexican Bean Beetle in Ontario, by L. S. McLaine (pp. 39–41); Some Notes on the Life-history of the Mexican Bean Beetle in Ontario, by H. F. Hudson and A. A. Wood (pp. 41, 42); Latest Developments in the Control of Stored Product Pests with Calcium Cyanide, by C. H. Curran (pp. 42, 43); A Cheap and Effective Fly Spray, by C. R. Twinn and F. A. Herman (pp. 43, 44); Mosquito Control Activities in Western Canada, by E. Hearle (pp. 45–50); Field Crop Insect Conditions in Saskatchewan, 1922–27, by K. M. King (pp. 50, 51); The Corn Borer Act in Operation, by L. Caesar (pp. 51–54); Parasites of the European Corn Borer, by D. W. Jones (pp. 55, 56); The Spread and Degree of Infestation of the European Corn Borer in Canada, 1927, by W. N. Keenan (pp. 56–59); On the Occurrence of *Aphodius pardalis* Lec. as a Pest of Lawns in British Columbia, by W. Downes (pp. 59–61); The Habits of the Onion Maggot Flies (*Hylemyia antiqua* Meigen), A. D. Baker (pp. 61–67); The Canadian Insect Pest Survey, by C. R. Twinn (pp. 67–69); Effect of Calcium Arsenate on Forest Trees, by A. Kelsall and J. P. Spittall (pp. 69, 70); The European Rose Sawfly in New Brunswick, by R. P. Gorham (pp. 70–72); The Golden-glow Borer (*Epiblema carolinana* Walsingham), by R. W. Thompson (pp. 73–75); Forecasting Outbreaks of the Army Cutworm (*Chorizagrotis auxiliaris* Grote), by H. L. Seamans (pp. 76–85); The Life of Professor William Lochhead, by Father Leopold (pp. 86–91); and The Entomological Record, 1927, by N. Criddle (pp. 92–103).

[Contributions on economic insects] (*Ztschr. Angew. Ent., 13 (1928), No. 3, pp. 419–570, figs. 33*).—Further papers presented on economic insects, particularly in Germany (E. S. R., 59, p. 853), include the following: A Contribution to the Knowledge of the Gooseberry Sawflies, by G. Wülker (pp. 419–450); Tests of New Chemicals for Combating the Granary Weevil, by R. Kleine (pp. 451–465); Investigations of the Resistance of Wall Papers to Insects, by E Handschin (pp. 466–476); Is *Lixus algirus* L. a Pest? by F. S. Bodenheimer (pp. 477-482); The Behavior of Palearctic Birds toward the More Important Forest Insect Pests, V–IX, by F. von Vietinghoff-Riesch (pp. 483–512); The Problems of Silk Production in Germany, by E. Tänzer (pp. 513–548); The Number and Maturation of Eggs of Some Lepidoptera of Importance to Forestry, by H. Eidmann (pp. 549–554); *Otiorhynchus scaber* L. (=*septentrionis* Hbst.) as a Pest of Silver Firs, by K. Escherich (pp. 554–557); Investigations of the Appearance of the European Corn Borer in South Germany, by W. Zwölfer (pp. 557–559; Ants and Plant Lice (pp. 559–563); A Forest Leaf-eating Grasshopper (*Barbitistes constrictus* Br.) as a Pine Pest, by E. Escherich (pp. 563–565); On the Question of the Influence of Lime on the Toxicity of Calcium Arsenate, by M. Klemm (pp. 565–567); The Life History and Control of *Zeuzera pyrina* L. in Palestine (p. 567) and The Copulation of *Heteropelma calcator* Wesm. (p. 568), both by E. O. Engel; What Insect Pests Cost Canada and the United States, by H. von Lengerken (pp. 568, 569); and The International Society of Microbiology (pp. 569, 570).

[Report on economic insects and their control in Guam], S. R. VANDENBERG (*Guam Sta. Rpt. 1927, pp. 14–17*).—In the course of coconut scale control work, a shipment of *Comperiella bifasciata*, parasitic on the diaspin scale, was received from California. One-third of the 70 parasites obtained were liberated in the field and others tested on the coconut scale with negative results under insectary conditions. A consignment of ladybird beetles (*Lindorus lopanthae*) received was reared and 22 individuals were liberated in the field, it being the second attempt to establish this predator. Reference is made to a shipment of the small black ladybird beetle (*Cryptogonus nigripennis*) to the Fiji Islands, where *Aspidiotus destructor* is becoming of increased importance. It is thought that as this ladybird beetle has effected complete control of the scale in Guam it should act similarly in Fiji.

Under the heading of miscellaneous notes reference is made to a number of insects and related pests. The European corn borer, present throughout the island, did perceptibly less damage than usual to the two main corn crops, due to the fact that a sufficient rainfall resulted in rapid growth of the plant.

Investigation of the Egyptian cotton worm (*Prodenia litura*) which attacks the taro crop led to the conclusion that it is impossible to eradicate or even to combat it except locally, since it is firmly established in Guam as a forest form. The taro is also attacked periodically by a leafhopper of the genus Megamelus and a fungus of the genus Gloeosporium. Edible canna appears to be free from these and other pests and is recommended as a substitute crop for taro.

A tick, apparently the brown dog tick, was observed for the first time in Guam.

Chrysomelid leaf beetles, first observed two years previously, are said to be spreading and doing considerable damage to the mango and rose-apple trees through feeding on the tender bark and new shoots as well as on the leaves.

A number of coconut palms were injured and a few were killed by the sugar cane borer (*Rhabdocnemis obscurus*), which, however, is not considered a menace to the copra industry.

An application of carbon disulfide on bits of cotton placed beneath the soil surface at about 2 in. from the stem was effectual in controlling the milliped attacking the pepper and other vegetable plants of bushy habit of growth. Plant bugs of the genus Leptoglossus attacking watermelons, squash, and muskmelons were effectively controlled by spraying with a solution made by macerating and steeping 4 lbs. of tobacco refuse in 1 gal. of water. The spray killed the eggs and nymphs and seemed to act as a repellent to the adults. A salt-line barrier was used effectively in preventing attack of the tomato plant by slugs.

A tineid leaf miner was found doing some damage to citrus trees. The life cycle of this miner is said to be completed in from 12 to 25 days, the generations overlapping each other. Kerosene emulsion sprays appeared to control effectively the Asterolecanium scale found attacking two specimens of serali tree (*Flacourtia ramonchi*) occurring on the island. An entomogenous fungus discovered attacking the California red scale gives promise of effectually suppressing any further spread of the pest.

Reports on insect pests in Ceylon during 1927 (*Ceylon Dept. Agr., Tech. Rpts. 1927, pp. 15*).—A brief report on the occurrence of and work with the more important insect pests in Ceylon, by J. C. Hutson, followed by reports of the plant pest inspectors, by N. K. Jardine, W. C. Lester-Smith and W. R. C. Paul, and C. N. E. J. de Mel, including a special report on rice pests, by Lester-Smith.

[Reports of the economic entomologist of Western Australia, 1927 and 1928], L. J. Newman (*West. Aust. Dept. Agr. Ann. Rpts., 1927, pp. 26, 27; 1928, pp. 28–30*).—Brief accounts are given of the occurrence of the more important pests in the years under report and means for their control.

Report of the chief entomologist for the year 1927, R. W. Jack (*South. Rhodesia Dept. Agr. Rpt. Sec. 1927, pp. 25–29*).—This report deals with the occurrence of the more important insects of the year under the headings of crops affected and work conducted.

Insects attacking vegetable crops in 1927, W. E. Britton (*Conn. Veg. Growers' Rpt. 1927, pp. 66–70*).—This is an account of the more important insect enemies of vegetable crops in Connecticut in 1927, with the control measures applied.

Insect pests of nursery stock, D. C. Mote (*Oreg. Bd. Hort. Bien. Rpt., 19 (1925–26), pp. 120–124*).—A brief practical account of the more important insect pests of nursery stock in Oregon.

[Insect control work at the Cranberry Substation], D. J. Crowley (*Washington Col. Sta. Bul. 229 (1928), pp. 62, 63*).—An application of 1.5 per cent oil spray gave better control of the San Jose scale on cranberries than did lime sulfur. The oil sprays seem to have a stimulating effect on the cranberry vines, which disappears, however, where two or three sprays are used.

The results obtained from summer oil sprays showed that the black-headed fireworm could be controlled by the application of a 1 per cent oil in combination with 40 per cent nicotine sulfate at a dilution of 1 gal. of nicotine to 600 gal. of water. Plats where the oil was used throughout the season were not in as thrifty a condition at the end of the spray season as those where the oil was used in combination with nicotine at a dilution of 0.5 gal. of the emulsion to each 100 gal. of water. No special economic advantage was found in the use of the free nicotine at 50 per cent over the regular nicotine sulfate spray. The 40 per cent free nicotine, however, gave a slightly better result than the nicotine sulfate.

During the season a small quantity of commercial insecticide known as concentrated Agri-Pax was tested on many of the cranberry insects, and it was found to kill the fireworm larvae at a dilution of 5 lbs. to 200 gal. of water. Nicotine sulfate was of little value in controlling the tussock moth caterpillars, but in 1928 concentrated Agri-Pax used at a strength of 8 lbs. to 200 gal. of water readily killed all that were full grown. Magnesium arsenate used against the fireworm and tussock moth was much superior to lead arsenate. Lauric acid tested against the fireworm was found to be unsuitable for a cranberry spray. The concentrated Agri-Pax in laboratory tests killed the fruit worm moths readily at dilutions of 4 lbs. to 100 gal. of water.

The dragonflies of Egypt, A. Andres (*Mém. Soc. Roy. Ent. Égypte, 3 (1928), No. 1, pp. 43, pls. 5, figs. 3*).—This synopsis of the Odonata of Egypt includes a bibliography of 18 titles and colored figures of 24 of the forms described.

Termites and architecture, T. E. Snyder (*Sci. Mo., 28 (1929), No. 2, pp. 143–151, figs. 21*).—A contribution on the bionomics of termites.

On the economic status and bionomics of Sminthurus viridis Lubb. (Collembola), W. M Davies (*Bul Ent. Research, 18 (1928), No. 3, pp. 291–296, pl. 1, figs. 2*).—This is a contribution from the Rothamsted Experimental Station in which experimental evidence of damage to grasses and clover is reported. Since specimens of *S. viridis* have been swept from grassland at Rothamsted in every month of the year, it is thought that the damage caused by this pest over such a period must be considerable.

Notes on the bionomics of cotton stainers (Dysdercus) in Nigeria, F. D. Golding (*Bul. Ent. Research, 18 (1928), No. 3, pp. 319–334*).—The author here gives an account of two distinct forms of the species *D. superstitiosus* F.; collates notes on the bionomics of the species of the genus accumulated from 1922 to 1927; and gives an account of the alternative food plants, supplementing previous information (E. S. R., 50, p. 755).

The paddy bug (Mormidea poecila Dall.), L. D. Cleare (*Agr. Jour. Brit. Guiana, 1 (1928), No. 3, pp. 155–158, pl. 1, fig. 1*).—This is an account of one of the more important pests of rice in British Guiana.

The common green capsid bug (Lygus pabulinus), F. R. Petherbridge and W. H. Thorpe (*Ann. Appl. Biol., 15 (1928), No. 3, pp. 446–472, pls. 2, figs. 8*).—This is a report of studies of the capsid bug *L. pabulinus*, which has become a serious pest of currants, gooseberries, strawberries, potatoes, and dahlias, and occurs on apples, pears, plums, cherries, peaches, and a large number of other cultivated plants and weeds. There were found to be two annual generations of this insect, the eggs being laid in the autumn in woody plants, such as currants, gooseberries, apples, and roses. The bugs migrate to herbaceous plants where the summer eggs are laid, the second generation returning to the woody host to oviposit. In the first generation a secondary migration from strawberries to other herbaceous hosts takes place.

An account is given of its injury to the more important host plants, of the habits of the bug in its several stages, and of control measures.

Observations on the buffalo tree hopper Ceresa bubalus Fabr. (Membracidae, Homoptera), and the bionomics of an egg parasite, Polynema striaticorne Girault (Mymaridae, Hymenoptera), W. V. Balduf (*Ann. Ent. Soc. Amer., 21 (1928), No. 3, pp. 419–435, fig. 1*).—This account is based upon observations made at Urbana-Champaign, Ill., during the spring, summer, and autumn of 1927, and at Oak Harbor, Ohio, during that summer. The studies relate particularly to *P. striaticorne*, a chalcid parasite of the eggs of Membracidae, especially of the buffalo tree hopper.

Notes on an outbreak of yellow sugar-cane aphis, L. D. Cleare (*Agr. Jour. Brit. Guiana, 1 (1928), No. 3, pp. 149–154, pls. 3, figs. 2*).—This is an account of the first recorded outbreak of *Sipha flava* Forbes in British Guiana, which occurred over the sugar-growing area of the coast lands of the Colony at a time when the plant was from 2 to 4 ft. in height. The biological complex, natural enemies, and control are considered.

Psithyrus laboriosus, an unwelcome guest in the hives of Apis mellifica, O. E. Plath (*Bul. Brooklyn Ent. Soc., 22 (1927), No. 3, pp. 121–125, figs. 2*).—The observations reported upon indicate that wherever *P. laboriosus* or other members of this genus are common they must be considered as minor enemies of the hive bee.

Chemicals in the apiary, with notes on their use, R. Hutson (*New Jersey Stas. Circ. 211 (1929), pp. 8*).—This is a discussion, in alphabetical order, of chemicals, sunlight, sugar, and other materials that have very definite properties which should be considered in judging their merits and deciding upon their use in the apiary. It is concluded that calcium cyanide is probably the best for the control of pests, and formalin solutions for the disinfection of such combs infected with American foulbrood as can be salvaged at a profit. As regards the relative merits of alcohol and water-formalin solutions, all tests conducted under control conditions have demonstrated a lower cost in favor of water-formalin with equal success in eliminating disease. While other chemicals also are useful in clearing up unsatisfactory apiary conditions, they are mostly of value in special instances.

Cultural studies of Bacillus larvae (White), A. G. Lochhead (*Sci. Agr., 9 (1928), No. 2, pp. 80–89, figs. 10*).—This is a report of experiments conducted with a view to discovering media suitable for the cultivation of *B. larvae*, a species which does not develop on the ordinary laboratory media. Plant extracts were found useful in cultivating the organism, a transparent medium containing carrot extract in addition to peptone and yeast having been found to give satisfactory development. The general cultural characteristics of *B. larvae* are described. This organism was found to exhibit pronounced variability in morphology according to the medium and cultural conditions obtaining.

[Second and third contributions on the Ichneumonidae of Japan], T. Uchida (*Jour. Facult. Agr., Hokkaido Imp. Univ., 21 (1928), No. 5, pp. 177–297+3, pls. 3; 25 (1928), No. 1, pp. 115, pls. 3*).—Part 2 (E. S. R., 56, p. 462) of this work deals with the subfamily Ophioninae of Japan. Some 164 species and 29 varieties are recognized, of which 79 species and 23 varieties are new to science. Five genera are erected.

Part 3 deals with the subfamily Pimplinae. Some 149 species and 33 varieties are recorded, of which 54 species and 21 varieties are new. Six genera are erected.

Both accounts conclude with a discussion of the geographic distribution of the forms in Japan and lists of references to the literature.

A new Campoplegidea parasitic on Ellopia fiscellaria Gn. (Hymen., Ichneumonidae), G. S. Walley (*Canad. Ent., 61 (1929), No. 1, pp. 22, 23*).—Under the name *C.* (*Viereckiana*) *ellopiae* n. sp. the author describes an ichneumonid reared from the hemlock looper (*E. fiscellaria*) in the Province of Ontario during the summer of 1928.

Methods employed in breeding Opius humilis Silv., a parasite of the Mediterranean fruit-fly (Ceratitis capitata Wied.), L. Ogilvie (*Bul. Ent. Research, 18 (1928), No. 3, pp. 289, 290, pl. 1*).—This is an account of the introduction of *O. humilis* into Bermuda and of a simple method of breeding the parasite found suitable under Bermuda conditions.

[The introduction of sugar-cane borer parasites from Tucumán, Argentina, into Louisiana], H. E. Box (*Sugar Bul., 6 (1928), No. 11, pp. 1–3; Span. trans. in Rev. Indus. y Agr. Tucumán, 18 (1928), No. 11–12, pp. 209–213*).—This consists of a communication in which the author discusses the status of sugar-cane parasites, and recommends the introduction of parasites of the larval stage of the borer from Tucumán into Louisiana.

Some data relative to the relationship of temperature to codling moth activity, T. J. Headlee (*Jour. N. Y. Ent. Soc., 36 (1928), No. 2, pp. 147–163*).—In this contribution from the New Jersey Experiment Stations (E. S. R., 59, p. 349), the author points out that thermal constants for beginning emergence and maximum emergence of the overwintered generation and the first summer generation of codling moth, determined by summation of day degrees of effective temperature, exhibit a sufficiently small amount of variation from year to year to render them satisfactory indicators of the time when insecticidal applications should be made for the control of the larvae of that insect entering apples. However, the dates, as determined by the thermal constants, should be checked against the codling moth bait pan records in order to make sure that the season in question does not exhibit some unusual type of variation.

"While the dates of beginning emergence and maximum emergence of the overwintered generation and the first summer generation seem to vary according to the latitude and altitude phase of the bioclimatic law, the writer feels that further data should be secured before dependence is placed upon this principle for determining the dates of insecticidal applications. When the average weekly minimum temperature approaches 60° F., codling moth transformation from larva to pupa ceases. It is probable, however, that the determination of this tendency of larvae to pupate occurs under a somewhat higher average minimum than 60° F., and it seems, in the writer's experience, that this determination of tendency takes place before the larva starts to spin its cocoon."

Recent developments in our knowledge of the codling moth and its control, R. H. Smith (*Blue Anchor, 5 (1928), No. 12, pp. 18, 70, 71, fig. 1*).—A brief review of recent studies of the codling moth as related to means for its control.

Response of the oriental peach moth and codling moth to colored lights, A. Peterson and G. J. Haeussler (*Ann. Ent. Soc. Amer., 21 (1928), No. 3, pp. 353–379, figs. 19*).—The authors find that the oriental peach moths and codling moths seek the light side of containers in which they are placed, indicating that they are positively phototropic under ordinary circumstances.

"When adults of both species, under laboratory conditions, are placed in pieces of apparatus similar to the ones employed in the tests the following responses occur: When all compartments, particularly in a 4-way apparatus, are equally lighted with white lights an equal (approximate) number of adults of both species will go into each chamber. When the compartments are unequally lighted with electric bulbs varying in strength between 10 and 100 watts, the largest number of moths will go to the strongest light.

"If moths of both species are given the choice of lights varying in color from red to violet and the ratios of (relative) intensities of the colored lights are approximately equal, practically all of the moths will go to blue and violet colored lights. Few or no adults of both species are attracted by red light. Orange and yellow lights are also unattractive when compared with bluish lights. Green light, possessing no blue rays, is also unattractive. Violet light is preferred to blue, and purple ultra lights appear to be more attractive than violet. It is probable that ultra-violet light is seen by oriental peach moths and that they are attracted by it. Codling moths appear to be somewhat more positively phototropic to blue and violet lights than oriental peach moths. So far as observed the response of males and females of the two species to colored lights appears to be similar. . . .

"Very few oriental peach moths come to ordinary white or artificial daylight electric lights in a peach orchard. Electric light traps have been used by a fruit grower for two or more seasons and have proved to be of little or no value in controlling the oriental peach moth."

Some hibernation quarters of the oriental fruit moth, B. F. DRIGGERS (*Jour. N. Y. Ent. Soc., 36 (1928), No. 4, pp. 435–437, figs. 9*).—In experiments made by the author at the New Jersey Experiment Stations, it was found that the larvae of the oriental fruit moth would overwinter in any kind of waste material found in and around orchards. Although the majority of the larvae found were in peach mummies, proportionally there were no more larvae in mummies than in some of the other situations noted. Thus, control of this insect by the destruction of the overwintering larvae on the ground should include the burning or plowing under in the spring of all mummies, pruned twigs, weeds, and other orchard débris.

Digestive enzymes of the oriental fruit moth, H. S. SWINGLE (*Ann. Ent. Soc. Amer., 21 (1928), No. 3, pp. 469–475*).—The author finds that the digestive enzymes of both larva and adult are secreted by the cells of the mid gut. Invertase, lipase, trypsin, and erepsin were found in the digestive tract of the larva. Digestion in the larva takes place under slightly alkaline conditions. Invertase was the only enzyme found in the adult. The ability to digest sucrose is apparently of no benefit to the average moth. Normal egg-laying was not secured under insectary conditions unless water was available for the moths.

Studies in the dispersion of Anopheles mosquitoes, H. W. KUMM (*Amer. Jour. Trop. Med., 9 (1929), No. 1, pp. 67–77, fig. 1*).—The author finds that in summer in North Carolina there is a very marked daily dispersion of Anopheles mosquitoes, very few of which remain for more than 24 hours in the place in which they have obtained a blood meal.

The Culicidae of Argentina [trans. title], R. C. SHANNON and E. DEL PONTE (*Rev. Inst. Bact.* [*Argentina*], *5 (1927), No. 1, pp. 29–147, figs. 23*).—This synopsis of the mosquitoes of Argentina includes a biblography of 14 pages.

Identification of the bloodmeal of Netherlands Indian Anopheles by means of the precipitin test (first report) [trans. title], E. W. WALCH and M. SARDJITO (*Geneesk. Tijdschr. Nederland. Indië, 68 (1928), No. 2, pp. 247–268; Eng. abs., pp. 266–268; Eng. trans. in Meded Dienst Volksgezondh. Nederland. Indië, 17 (1928), No. 2, pp. 234–250*).—This is a first communication on work with the precipitin test in the identification of the host from which blood has been ingested. The work of S. T. Darling[3] and W. V. King and C. G. Bull,[4] who have shown by means of the test that in the United States *A. crucians* and *A. punctipennis*, though susceptible to experimental infection with the malarial organism, are not as a rule efficient vectors because they prefer animal blood to that of man, led to investigations in the Netherlands East Indies. Precipitin sera were prepared principally by the technique of R. Tsukasaki[5] for man and eight of the domesticated animals.

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[3] South. Med. Jour., 18 (1925), No. 6, pp. 452–457.

[4] Amer. Jour. Hyg., 3 (1923), No. 5, pp. 497–513.

[5] Tohoku Jour. Expt. Med., 3 (1922), No. 5–6, pp. 658–657.

Studies on anophelism without malaria in the vicinity of Amsterdam [trans. title], A. DE BUCK, E. SCHOUTE, and N. H. SWELLENGREBEL (*Centbl. Bakt. [etc.], 1 Abt., Orig., 109 (1928), No. 5–6, pp. 251–284, pl. 1, figs. 11*).—The account is based upon the investigations noted from another source (E. S. R., 60, p. 561).

British mosquitoes and their control, F. W. EDWARDS and S. P. JAMES (*Brit. Mus. (Nat. Hist.), Econ. Ser., No. 4A (1925), pp. 27, figs. 4*).—This is a more extended account than that previously noted (E. S. R., 39, p. 766).

Wheat blossom midges (Cecidomyiidae, Diptera): Differences between Contarinia tritici (Kirby) and Sitodiplosis mosellana (Géhin), H. F. BARNES (*Bul. Ent. Research, 18 (1928), No. 3, pp. 285–288, figs. 3*).—This is a contribution from the Rathamsted Experimental Station.

Notes on the habits of Aphiochaeta aletiae, W. V. BALDUF (*Ohio Jour. Sci., 28 (1928), No. 5, pp. 237–245, figs. 4*).—A report of studies of a dipteran of the family Phoridae which was reared from the spindle stalk borer (*Achatodes zeae* Harr.) in Illinois and which may be proved to be parasitic.

Observations on the life history, habits, and control of the narcissus bulb fly Merodon equestris Fab. and the lesser bulb fly Eumerus strigatus Fallen in Oregon, J. WILCOX (*Oreg. Bd. Hort. Bien. Rpt., 19 (1925–26), pp. 149–158, figs. 10*).—A contribution from the Oregon Experiment Station on the biology, importance, and control of these bulb pests.

The house-fly: Its life-history, importance as a disease carrier, and practical measures for its suppression, E. E. AUSTEN (*Brit. Mus. (Nat. Hist.), Econ. Ser., No. 1A, 3. ed. (1928), pp. 71, pls. 3, figs. 7*).—This is a revision of the work previously noted (E. S. R., 57, p. 263).

Zoological contributions to the surra problem.—XX, Further transmission experiments with tabanids in Sumatra [trans. title], O. NIESCHULZ (*Dept. Landb., Nijv. en Handel Nederland. Indie, Veeartsenijk. Meded., No. 66 [1928], pp. 59, pls. 3; Ger. abs., pp. 52–58*).—Thirteen species of tabanids are dealt with, one of which is new, and all of which have been found capable of transmitting the causative agent (E. S. R., 59, p. 673).

Zoological contributions to the surra problem.—XXI, Further surra transmission experiments with Tabanus striatus Fabr. and T. rubidus Wied. [trans. title], O. NIESCHULZ (*Arch. Protistenk., 65 (1929), No. 1–2, pp. 78–96, fig. 1*).—Further experiments with these two tabanid transmitters of surra are reported (see above).

Studies on Oscinella frit Linn., N. CUNLIFFE (*Ann. Appl. Biol., 15 (1928), No. 3, pp. 473–487*).—A report of observations on infestation and yield, susceptibility to infestation, recovery power, the influence of variety on the rate of growth of the primary shoot of the oat, and the reaction to manurial treatment.

Aserica castanea: A new Japanese lawn pest, W. BEUTENMULLER (*Bul. Brooklyn Ent. Soc., 23 (1928), No. 2, p. 68*).—An account is given of the appearance of the Asiatic beetle at Teaneck, N. J., in the summers of 1926 and 1927. The beetles seriously injured English ivy and the larvae attacked lawns, causing the grass to turn brown and die.

The Pacific flathead borer, H. E. BURKE and A. G. BÖVING (*U. S. Dept. Agr., Tech. Bul. 83 (1929), pp. 36, figs. 12*).—This is a report of studies of *Chrysobothris mali* Horn, one of the worst enemies of newly planted deciduous trees and shrubs on the Pacific slope. It kills or injures many in the nursery and many more after they have been transplanted to the yard, park, cemetery, street, highway, or orchard; causes the total destruction of some plantings; and prevents the growing of some species of trees and shrubs in certain localities. Mention is made of prune orchards observed in the foothills of the Santa Cruz Mountains where every tree was killed the first year, and to apple orchards in the western foothills of the Sierras in which every tree had been attacked, some having as many as 15 borers under the bark of the main trunk.

The present bulletin gives a summary of the data obtained from a study of its biology made at intervals during the last 15 years. It is known to attack and kill or seriously injure by girdling the main trunk of over 55 species of ornamental plants, and seriously injures some of the more valuable fruit trees, including the apple, pear, peach, plum, apricot, and prune.

Eggs are laid during the spring and early summer on the bark or in a crevice of the bark of the main trunk or branches of the plant attacked. On hatching the larva bores into and mines back and forth through the inner bark for 6 or 8 weeks until it is fully developed. The pupal cell is then formed in the outer wood, where it remains quiescent until the following spring. It pupates sometime between the middle of March and the middle of June, and in from 3 to 5 weeks transforms into a young beetle, emerging from the cell in from 1 to 2 weeks. The eggs are laid on the bark, and the life cycle is completed.

The use of the yucca tree protector, which keeps the female beetle from depositing her eggs on the bark of the main trunk, is said to be the best method of protecting the tree. Cutting out the borers with a sharp knife in the late spring or early summer before their growth is completed is said to be the best method of saving the tree.

A list is given of 38 references to the literature.

The status of the Colorado potato beetle in France at the beginning of the 1928 campaign [trans. title], J. Feytaud (*Rev. Zool. Agr. et Appl., 27 (1928), No. 5, pp. 69–83, figs. 2*).—This is an account of the occurrence of the Colorado potato beetle in France and the control work under way.

The turnip mud beetles (Helophorus rugosus Ol. and Helophorus porculus Bedel.), F. R. Petherbridge (*Ann. Appl. Biol., 15 (1928), No. 4, pp. 659–678, pl. 1, figs. 8*).—This is a report of studies of two beetles which have at times caused serious damage to late-sown white turnips in the east of England and to lettuce in Surrey during the last few years.

Experiments on the control of flea-beetles of the genus Phyllotreta injurious to cultivated crucifer crops, H. C. F. Newton (*Jour. Southeast. Agr. Col., Wye, Kent, No. 25 (1928), pp. 116–140*).—The possibility of an early underground attack in combating flea beetles is pointed out, also that successful control can not be obtained unless prompt action is taken as soon as the attack occurs. Deterrents were found to be very much more effective than contact or stomach poisons, and nicotine sulfate either as a spray fluid or dust gave the best deterrent action. In small scale experiments sodium fluosilicate gave distinct promise. Seed steeping in paraffin and turpentine gave negative results.

The metamorphosis and biology of Rhynchaenus alni L. (Coleoptera), J. N. Oldham (*Ann. Appl. Biol., 15 (1928), No. 4, pp. 679–698, figs. 22*).—This is a report of studies of a species that is not only a miner in its larval state on Alnus but also an enemy of Ulmus, and occurs more commonly as a pest of elms.

New injurious Curculionidae (Col.), G. A. K. Marshall (*Bul. Ent. Research, 18 (1928), No. 3, pp. 257–266, figs. 5*).—In this paper the author includes descriptions of seven species and one genus new to science.

The bud form of the pear leaf blister mite, W. B. Parker (*Blue Anchor, 5 (1928), No. 12, pp. 20, 21, 73, figs. 2*).—The author has found two varieties of the pear leaf blister mite to attack pear trees in California. There is no morphological difference, but their habits and the type of injury they cause are quite different. The control measure applied effectively against the regular pear leaf blister mite, usually the application of lime sulfur in the fall, is not at all effective against the bud mite. The foliage oils have been found to have some effect on the bud mite when used with arsenate of lead for codling moth or for red spider. Trees sprayed with oil and arsenate in Contra Costa County had fewer mites in the buds than trees in neighboring orchards.

The red spider mite (Tetranychus telarius L.), E. SPEYER (*Jour. Pomol and Hort. Sci.*, *7* (*1928*), *No. 3*, *pp. 161–171*, *pls. 2*).—Following a brief account of the life history and habits of this pest, the author deals with its control in greenhouses. He recommends fumigation with crude naphthalene, after the crop is finished but not later than the middle of October, volatilized from lamps for at least 10 hours at a temperature of not less than 70° F. Where naphthalene has not been used, a thorough cleansing should be given houses which had been infested during the previous season with cresylic acid and soft soap spray during the winter. He recommends the early spraying of cucumber, tomato, and melon plants, but not carnations, with a suitable petroleum oil emulsion, replaceable by soft soap and liver of sulfur mixture which may be used for carnations when soft water is obtainable. Cucumber and tomato plants should be sprayed with oil emulsion from the end of August until the crop is removed, to prevent mites leaving the plants for hibernation. The use of naphthalene fumigation for broadcasting is recommended for controlling infestations during the summer in cucumber houses.

The life-history of the black currant gall mite, Eriophyes ribis (Westw.) Nal., A. M. MASSEE (*Bul. Ent. Research*, *18* (*1928*), *No. 3*, *pp. 297–309*, *pls. 2*, *fig. 1*).—This is an account of the life history of *E. ribis*, presented in connection with a list of 25 references to the literature.

The spiders of Porto Rico.—Part I, Nelipoda, Hypodemata, Tetrasticta, and Trionycha (to Leptonetidae), A. PETRUNKEVITCH (*Conn. Acad. Arts and Sci. Trans.*, *30* (*1929*), *pp. 158*, *figs. 150*).—This first part of the author's synopsis deals with the Nelipoda, Hypodemata, Tetrasticta, and Trionycha.

ANIMAL PRODUCTION

Feeds and feeding E. W. CRAMPTON (*Macdonald Col., McGill Univ., Farmers' Bul. 3* (*1928*), *pp. 74*).—This popular publication is divided into three parts. In part 1 the needs and functions of the animal are described as if the animal represented a factory. In the second part the composition, nutritive value and feeding value of many feedstuffs are taken up, and their value for the various classes of livestock is given. Part 3 deals with the art of combining the feedstuffs into suitable rations. Appended is a short chapter explaining the various steps to be taken in balancing a ration.

Feeding stuffs, A. S. CARLOS (*London: Chapman & Hall, 1928*, *pp. XI+152*, *pls. 4*, *figs. 3*).—A treatise presenting information in a concise form on the source, method of production, and use of various feeds. Directions are also given for preparing rations for the various classes of livestock.

Digestibility trials on Indian feeding stuffs.—III, Some Punjab hays, P. E. LANDER and P. L. C. DHARMANI (*India Dept. Agr. Mem., Chem. Ser.*, *9* (*1928*), *No. 7*, *pp. 231–246*, *fig. 1*).—In continuing the digestion trials previously noted (E. S. R., 58, p. 761), the digestibility of Jutogh and Jullundur hays was determined, using two 3-year-old heifers with each kind of hay. The analyses of these hays and the detailed results of the digestion trials are appended.

Investigations in the bacteriology of silage, 1926–27, J. H. WALTON (*Agr. Research Inst., Pusa, Bul. 182* (*1928*), *pp. 13*).—Samples of juice from maize and jowar (*Sorghum vulgare*) silages were examined by the Agricultural Research Institute, Pusa, India, for pH and total acidity, and direct microscopic counts and plate counts on various media were made to estimate the number of bacteria present.

The acidity as indicated both by the pH and the total acidity did not develop as rapidly nor to as high a degree in the jowar as in the maize silage. Also the bacterial counts as determined by the direct and plate count methods were lower in the jowar. The organisms *Bacterium fermentationis*, *Achromobacter fermentationis*, *Streptococcus lactis*, and slender rods belonging to the Lactobacillus group were isolated from the juices.

It was found that when the moisture content of the maize was high, acidity did not develop as rapidly as when it was lower. In some cases acidity developed so slowly that slight putrefactive changes took place. Jowar silage never attained the pleasant clean aroma of the maize silage, but with either crop a good quality of silage was produced when the acid forming bacteria produced over 2 per cent of acid in the juice within 3 to 5 days after the silage was placed in the containers.

The correlation of nutritive value with dry matter content of pastures, E. J. SHEEHY (*Roy. Dublin Soc. Sci. Proc., n. ser., 18 (1927), No. 32, pp. 389–398*).—A comparison by the Department of Lands and Agriculture, Irish Free State, of the value of pastures of the fertile lands of Meath and the average lands of Kildare showed a wide variation in the botanical character of the two. The pasture in the Kildare section contained a large proportion of miscellaneous plants, many of which were broad leaved, while the Meath pasture consisted of densely packed grass leaves with an admixture of clover. Little or no difference was found in the chemical composition or digestibility of the two pastures. However, there was about 25 per cent more dry matter in the Meath pastures. A definite correlation was found to exist between the dry matter present and the relative proportions of miscellaneous plants. On this basis dry matter may be considered as one factor in partial explanation of the increased nutritive value of pastures in which grass makes up the bulk of the vegetation.

Minerals in pastures and their relation to animal nutrition, J. B. ORR (*London: H. K. Lewis & Co., 1929, pp. XV+150, figs. 2*).—This monograph, in the preparation of which the author was assisted by H. Scherbatoff, reviews the whole question of the mineral content of pastures. The various sections deal with the mineral content of pastures, factors affecting the mineral content, and deficiency diseases that occur in grazing animals in different parts of the world.

The utilization of sulphur by animals, with especial reference to wool production, H. R. MARSTON and T. B. ROBERTSON (*Aust. Council Sci. and Indus. Research Bul. 39 (1928), pp. 51*).—A review of the literature gathered from many scattered sources in the last 30 or 40 years, with special reference to the utilization of sulfur in the production of wool. The introduction by T. B. Robertson is a review of the chemistry of animal nutrition, with special reference to the rôle played by amino acids and especially to that of cystine.

The influence of minute doses of iodine and iron on growth of rats furnished vitamin A free diet, F. E. CHIDESTER, A. G. EATON, and G. P. THOMPSON (*Science, 68 (1928), No. 1766, p. 432*).—Studies at the West Virginia Experiment Station showed that the addition of iodine and iron to a vitamin A free diet for rats was in most cases beneficial and in a few cases effected a complete cure of xerophthalmia. However, these minerals when added to an inadequate diet did not keep growth up to a normal rate.

Some effects upon the young of inadequate maternal diets.—I, Polyneuritis and hemorrhages, C. U. MOORE, J. L. BRODIE, and R. B. HOPE (*Amer. Jour. Physiol., 82 (1927), No. 2, pp. 350–357, figs. 6*).—On a diet consisting of casein 18, Crisco 3, cod-liver oil 2, salt mixture 4, dextrin 71, and yeast 2 parts, the authors found that the size of litters of white rats was reduced and that 72.9 per cent of the young were lost before the end of the weaning period. One-half of the deaths which occurred in the first week were characterized by subcutaneous, visceral, and intracranial hemorrhages. The remaining deaths occurred in the third week, preceded by marked paralysis. Post-mortem examinations showed myelin degeneration of the sciatics, vagi, and other myelinated nerves, and macroscopic and microscopic visceral and intracranial hemorrhages. The addition of lemon juice to the ration had no apparent effect upon paralysis or hemorrhagic condition.

When the yeast content of the mother's diet was increased to 7 per cent, the mortality in the young decreased to 9.3 per cent, paralysis was practically eliminated, and the number of hemorrhages reduced. Feeding the experimental ration directly to the paralyzed young resulted in complete recovery. This study indicates separate identities of a B-growth and an antineuritic factor in yeast.

How to build up and improve a herd or flock (with description of their most common diseases in the Philippines), D. C. KRETZER (*Philippine Agr. Rev., 21 (1928), No. 3, pp. 215–331, pls. 33*).—A treatise designed to assist the producer of livestock in the islands to improve the quality of his product. It contains some interesting facts concerning the present classes of animals. The diseases affecting the animals of the islands and their control or treatment are discussed in a popular manner.

A study of factors influencing quality and palatability of meat, H. E. DVORACHEK (*Arkansas Sta. Bul. 231 (1928), pp. 35, 36*).—In concluding this study (E. S. R., 58, p. 354) it was found that the average birth weights of calves dropped in the spring of 1927 from the purebred cows in the Aberdeen Angus lot, from the grade and scrub cows sired by purebred bulls, and from the scrub cows sired by scrub bulls were 66.3, 65.7, 63.7, and 68.6 lbs. per head, respectively. Up to weaning time the average daily gains were 1.64, 1.69, 1.73, and 1.75 lbs. per head, respectively. After weaning all lots were full fed for 168 days on a ration of corn and cob meal, cottonseed meal, alfalfa hay, and sorghum silage. At the end of the feeding period they were shipped to market and slaughtered. The shrink in shipping was approximately the same in all lots. On a warm weight basis the average dressing percentage was 59.4, 59.9, 59.8, and 58.5 in the respective lots.

The average grades of the lots as feeder cattle were 82.24, 83.82, 79.97, and 71.35 per cent; as slaughter cattle 81.27, 77.75, 73.15, and 66.99 per cent; and as carcass cattle 77.92, 78.39, 74.94, and 67.98 per cent, respectively.

It has been determined that the percentage of beef blood an animal carries does not influence to any great extent the birth weight, development before weaning, or rate or economy of gain in the feed lot, but does increase the selling price on the market. This increase in selling price is justified by the carcass score of the well-bred animal.

Beef cattle investigations, 1927–28 (*Kansas Sta., Fort Hays Substa. [Pamphlet], 1928, pp. 7*).—Continuing the study of the utilization of feed crops by stock cattle (E. S. R., 57, p. 458), 6 lots of yearlings and 5 lots of calves of 10 animals each were fed for 145 days, except for 2 lots of yearlings fed kafir and cane silage which were on feed for 112 days. All lots received 1 lb. of cottonseed cake per head per day. In addition, kafir hay, kafir fodder, kafir silage, kafir stover, kafir stover silage, and cane silage were fed to the respective lots in the yearling group, while kafir hay, kafir stover, kafir stover silage, cane stover, and cane hay were fed in the respective lots of the calf group. The average daily gains were 0.93, 1.21, 1.38, 0.59, 0.47, and 1.55 lbs. per head in the yearling group and 0.77, 0.56, 0.65, 1.02, and 1.12 lbs. per head in the calf groups.

It was found that an acre of kafir in the form of silage produced from 2 to 2.5 times as much gain when fed to yearlings as did the same kind of kafir fed cured and dried when each was supplemented with cottonseed cake. Approximately one-half to two-thirds of the feeding value of kafir either as silage or dry cured feed was in the seed of the fully matured heavy grain-producing plant. Cane hay fed to calves produced greater gains per acre than did kafir hay, and the same was true of cane and kafir stover. The principal acre gains were increased approximately 250 per cent when kafir stover silage was fed instead of kafir stover.

The calves in this test gained approximately 2.25 times as much weight per acre and per ton of feed as did the yearlings. The latter cattle, averaging 750 lbs. per head, required about twice as much feed to produce the same gain as did the calves averaging 500 lbs. per head.

[Cull apples, potatoes, and carrots compared to corn silage for] fattening beef cattle, H. Hackedorn, J. Sotola, and R. P. Bean (*Washington Col. Sta. Bul. 229* (*1928*), *p. 19*).—When fed corn silage at the rate of 2.5 parts to 1 part of cut alfalfa hay, a group of 16 beef cows, weighing from 800 to 850 lbs. each, required 956 lbs. of hay and 2,455 lbs. of corn silage per 100 lbs. of gain. A similar group of cows fed cull potatoes in place of corn silage required 1,018 lbs. of hay and 2,627 lbs. of potatoes per 100 lbs. of gain. The cows fed potatoes gained faster and were fatter at the end of the feeding period than those fed corn silage.

Effect of winter rations on pasture gains of calves marketed as three-year-old steers, C. V. Wilson, R. H. Tuckwiller, and E. W. Sheets (*West Virginia Sta. Bul. 218* (*1928*), *pp. 15, figs. 5*).—In concluding this cooperative study with the U. S. D. A. Bureau of Animal Industry (E. S. R., 56, p. 163), it was found that as a rule the cattle which made the least winter gains made the greatest summer gains. However, there was little difference in the average annual gains of the various lots. When the cattle were sold as 3-year-olds, having all been finished on the same ration on pasture, they brought the same price per pound regardless of what wintering ration they had received. This test points out that the cost is of relatively more importance than the kind of ration when fed to calves and yearlings that are to be finished on pasture as 3-year-olds.

Beef steer feeding experiments, A. F. Wande (*Union So. Africa Dept. Agr. Bul. 42* (*1928*), *pp. 30, figs. 13*).—Part 1 of this bulletin reports the results of a feeding test with 2 lots of 11 4-year-old steers each, at the Potchefstroom Experiment Station. The animals were all fed the same ration except that lot 1 received cottonseed meal while lot 2 received twice as much crushed cottonseed. The average daily gain for the steers in lot 1 was 1.7 lbs. per head and in lot 2 1.82 lbs. per head. However, the average cost of production was higher and the average selling price and dressing percentage were lower in lot 2. These results led to the conclusion that crushed cottonseed has about one-half the feeding value of an equal amount of cottonseed meal.

In part 2 are reported the results of different methods of preparing steers for market. Three lots of 7 2-year-old steers each were fed as follows: Veld grazing only, maize silage and teff hay, and maize silage, teff hay, and a heavy concentrate ration. There was a financial loss on all lots in this test. Grazing alone was a rather questionable practice as the finish and price depended upon the season. A heavy feeding of concentrates made the cost of production too high to be profitable. The lot receiving silage and hay more nearly approached ideal conditions for preparing steers for market under existing conditions than either of the other lots.

Sheep production in Mississippi, H. H. LEVECK and D. S. BUCHANAN (*Mississippi Sta. Bul. 260 (1928), pp. 36, figs. 16*).—Part 1 of this publication gives popular information on the selection, breeding, feeding, and management of sheep under Mississippi conditions. Plans and measurements for equipment that is necessary for the economic handling of sheep are also given. Some of the more common sheep ailments are discussed, and methods of preventing or treating these ailments pointed out.

In part 2 the results of grading up a flock of native ewes by the use of purebred rams of several breeds from 1916 to 1920 are given. In 1916 75 2- and 3-year-old native ewes were divided into 3 lots and purebred Southdown, Shropshire, and Dorset rams run with the respective lots. A 75 per cent lamb crop was raised from these ewes in 1917, and the best ewe lambs were retained. In the fall of this year the ewes were divided into 4 lots and a purebred Merino ram run with the added lot. In 1918 a 95 per cent lamb crop was raised. The average birth weight of the lambs by the Southdown ram was 6.8 lbs., by the Shropshire 7.3, by the Dorset 7.1, and by the Merino 6.4 lbs. per head. In 1919 an 88 per cent lamb crop was raised. The lambs from the native ewes were larger than those from the grade ewes at birth, due probably to the fact that the grade ewes were not mature. The average weight of fleece of the grade ewes was practically double that of the natives. In 1920 a 77 per cent lamb crop was raised. Again the lambs from the native ewes were heavier at birth, and the weight of the fleece of the grade ewes was heavier than that of the native ewes No records were kept of the flock during 1921–1924.

During the winter of 1925–26, 90 breeding ewes were fed for 94 days on an average daily ration of 0.49 lb. cottonseed meal and 1.33 lbs. Johnson grass hay, on which they made an average daily gain of 0.075 lb. per head. The feed cost per ewe on this ration was $1.54. That the ration was satisfactory during the gestation period is shown by the 118 per cent lamb crop, but the ration was not satisfactory during the nursing period as shown by the rather poor gains of the lambs.

In the 1926–27 trial, 95 breeding ewes were wintered for 58 days on an average daily ration of 0.78 lb. cottonseed meal, 0.39 lb. wheat bran, and 1.03 lbs. Johnson grass hay. The ewes made an average daily gain of 0.007 lb. at a feed cost of $1.13 per ewe on this ration. An 89 per cent lamb crop, 77 per cent of which were weaned by the end of the feeding period, showed this ration to be an economical one.

The 1927–28 wintering trials were made with 3 lots of 25 ewes each fed for 70 days on an average daily ration of 0.28 lb. corn, 0.44 lb. cottonseed meal, 0.28 lb. wheat bran, and either alfalfa, Johnson grass hay, or soy bean hay. The ration containing Johnson grass hay was discontinued after 51 days, due to the fact that the ewes were unable to produce enough milk to feed their lambs properly on this ration. A 101 per cent lamb crop was raised by the combined lots. No noticeable differences in the condition of the ewes or lambs in lots 1 and 3 were noted, but the ration containing soy bean hay was somewhat cheaper.

A study of stomach worm control showed that drenching every 14 days with a 1 per cent copper sulfate solution was more effective than drenching every 4 weeks with Lugol's solution or every 3 weeks with a 1 per cent copper sulfate solution.

[Experiments with lambs at the Washington Station], H. HACKEDORN, J. SOTOLA, and R. P. BEAN (*Washington Col. Sta. Bul. 229 (1928), pp. 19, 20*).—The results of two experiments are noted.

Cull apples, potatoes and carrots compared to corn silage for fattening lambs.—Lambs averaging from 76 to 80 lbs. in weight were divided into 4 lots of 20 head each and fed an average daily ration of 1 lb. of white soft wheat, all the cut alfalfa hay they would eat, and equal amounts of either corn silage, cull apples, potatoes, or carrots. The lot receiving potatoes made the most rapid gains and required the least grain per 100 lbs. of gain. This lot was closely followed by carrots and apples in rate and economy of gains, with corn silage ranking last.

Preparation of alfalfa hay.—Long alfalfa hay, hay chopped in 0.5 in. lengths, or hay ground to about the size of alfalfa leaves was fed with 1 lb. of grain per day to 3 lots of lambs. A second series of lots received the same rations with the addition of 1.5 lbs. of silage per day. The lambs fed ground hay made the most rapid gains and attained the best finish in both series of lots, making approximately 10 to 15 per cent more gain than lots fed other kinds of hay. About 25 per cent of the long hay and 10 per cent of the chopped hay were refused by the lambs. However, the gains and finish were better in the long hay than in the chopped hay lots. Finely ground hay was less palatable than hay ground to the size of leaves.

The individuality of the pig: Its breeding, feeding, and management, R. MORRISON (*New York: E. P. Dutton & Co., 1928, pp. XII+524, pls. 24, figs. 31*).—This is an American edition, slightly revised, of the treatise previously noted (E. S. R., 58, p. 866).

[Experiments with swine at the Arkansas Station], E MARTIN (*Arkansas Sta. Bul. 231 (1928), pp. 42–44*).—The results of two experiments are noted (E. S. R., 58, p. 357).

Soft pork investigation.—Pigs averaging approximately 128 lbs. each were divided into 4 lots of 10 pigs and 4 lots of 6 pigs each. The 10-pig lots had access to yellow corn in the field and a mineral mixture. In addition lot 1 received Laredo soy beans, lot 2 Virginia, lot 3 Mammoth Yellow, and lot 4 tankage. The 6-pig lots received the same supplements in a self-feeder and the same variety of corn fed in dry lot on the ear. The average daily gains for the first series of lots were 1.29, 1.54, 1.58, and 1.74 lbs. per head and for the second series 1.58, 1.5, 1.26, and 1.63 lbs. per head, respectively.

On the basis of carcass gradings it was concluded that pigs of an initial weight of 125 lbs. and making an average daily gain of at least 1.5 lbs. for about 8 weeks on corn and soy beans hogged down produced firm carcasses in approximately 70 per cent of the cases, but when the daily gains were 1.4 lbs. or less only about 50 per cent of the carcasses were firm. When the initial weight ranged from 111 to 124 lbs. and the rate of gain was 1.5 lbs. daily, firm carcasses were produced in 70 per cent of the cases, but when the gain dropped to 1.4 lbs. or less only about 30 per cent of the carcasses were firm. Pigs with an initial weight of 110 lbs. or less produced carcasses of unsatisfactory firmness in 80 per cent of the cases when the daily gain was 1.4 lbs., and unsatisfactory carcasses were produced in 40 per cent of the cases when the gain was 1.5 lbs.

The Virginia variety of soy beans was ready for use about 2 weeks before the other varieties, and in this test the Laredo variety was inferior in feeding value to the other two.

In another study it was found that pigs averaging 44 lbs. per head initial weight gained but 0.21 lb. daily on a ration of rice bran, tankage, and minerals self-fed on rye pasture for 8 weeks. When changed to brewer's rice at the end of this time they were in poor physical condition and very unthrifty. During a 10-week period on brewer's rice they gained 1.64 lbs. per head daily. A similar lot fed rice polish instead of rice bran gained but 0.17 lb. per head daily during the first 8 weeks, but when changed to brewer's rice for 10 weeks gained at the rate of 1.56 lbs. per day. Similar lots fed in an identical manner for the first 8 weeks and then changed to corn gained 1.65 and 1.49 lbs. per head daily for the 10 weeks' period. The carcasses of all these pigs were satisfactory after 10 weeks' feeding on brewer's rice or corn, but the latter feed produced the firmer carcasses.

Gilts fed from weaning to farrowing time on a ration of rice polish, rice bran, and tankage 60:30:10 and then changed to the regular farm ration produced 29 pigs that when fed to market weight on hardening feeds graded as carcasses 19 hard and 10 medium hard. The average refractive index of the fat of these pigs was 1.4595.

Legume hays for brood sows.—In this study 3 lots of 3 gilts each were fed as follows: Lot 1, white corn chops, alfalfa meal, and tankage 80:15:5; lot 2, white corn chops and tankage 95:5, with alfalfa hay in racks; and lot 3, white corn chops and tankage 85:15. The grain mixture was hand fed in all lots.

There was no significant difference in the feed consumption or farrowing records of these lots. Lot 1 weaned 20 of the 24 pigs farrowed. In lot 2 21 pigs were raised, but 1 sow developed rickets, which was cured by using cod-liver oil. One sow in lot 3 farrowed 11 and another 12 apparently healthy pigs, all of which died within 3 days. The other sow farrowed 9 pigs, 5 of which died during the first 5 days, but the remainder were raised. It was believed that if the grain in lot 2 had been limited more hay would have been consumed and the sows would have been more completely protected from deficiencies in the ration.

[Feeding tests with swine at the Guam Station], C. W. Edwards (*Guam Sta. Rpt. 1927, p. 3*).—The results of two tests in continuation of those previously noted (E. S. R., 59, p. 565) are reported.

Coconut meal and cassava for brood sows.—A ration consisting of equal parts of coconut meal and fresh cassava, together with a plentiful supply of fresh Para grass, was fed to 2 gilts and 1 sow from time of service to weaning time. During the suckling period each animal received 2 oz. of tankage daily. On this ration 1 gilt farrowed and raised 7 pigs, the other 5 pigs, and the sow 10 pigs. The dams remained in good condition, and the pigs were healthy and of normal weight.

Mineral mixture for growing pigs.—A ration of coconut meal and ground corn 2:1 was fed to 2 lots of 5 3-months-old gilts each on Para grass pasture for 30 days. In addition 1 lot received a mineral mixture of salt, charcoal, ground limestone, and wood ashes 20:15:25:40. The average daily gains were 1.07 lbs. per head in the lot receiving no minerals and 0.82 lb. per head in the lot receiving minerals. Under the conditions of this test the pigs did not require mineral supplements.

Can seed-wheat treated with copper carbonate be used as a hog feed? H. G. McDonald and J. E. McCoy (*Washington Col. Sta. Bul. 229 (1928), p. 18*).—Continuing this study (E. S. R., 54, p. 861), 2 lots of 9 pigs each were self-fed, 1 lot on a ration of wheat treated with 3 oz. of copper carbonate per bushel and tankage and the other lot on untreated wheat and tankage. During the 53-day feeding period the pigs fed treated wheat lost 36 lbs., while those on untreated wheat gained 638 lbs. The carcasses of the pigs fed treated wheat were condemned at slaughtering time.

Preliminary trials on washing treated wheat before feeding indicated that the practice had favorable possibilities.

[Feeding horses at the Guam Station], C. W. Edwards (*Guam Sta. Rpt. 1927, p. 2*).—That one-third to one-half by weight of the regular oat ration could be economically replaced by coconut meal was confirmed in tests conducted in continuation of those previously noted (E. S. R., 55, p. 160).

Horse training, H. S. J. BOURKE (*London: Hutchinson & Co., [1928], pp. 215, [pls. 15]*).—This interesting and practical treatise is divided into three parts, as follows: (1) The polo pony, (2) jumping, and (3) racing.

[Experiments with poultry at the Arkansas Station], R. M. SMITH (*Arkansas Sta. Bul. 231 (1928), pp. 38–41*).—The results of three experiments in continuation of those previously noted (E. S. R., 58, p. 360) are briefly reported.

A study of the influence of mineral, cod-liver oil, alfalfa leaf meal, sprouted oats, and sunshine supplements upon the hatchability, fertility, and production of the egg.—The same basal ration was fed to 6 lots of 20 pullets and 1 cockerel each. Lot 1 was used as a check, lot 2 received in addition 4 per cent of steamed bone meal and 1 per cent of salt, lot 3 cod-liver oil to replace 2 per cent of the mash, lot 4 alfalfa meal to replace 10 per cent of the mash, lot 5 sprouted oats, and lot 6 sunshine through Cel-O-Glass. The male birds were transferred to an adjacent pen every 2 days in order to eliminate their influence upon differences in fertility.

The percentages of production, hatchability, and fertility of eggs in each lot for the period from December 10 to June 10 were respectively for lot 1, 35.69, 50, and 67.2; lot 2, 36.3, 49.33, and 93.05; lot 3, 36.3, 52.73, and 76.72; lot 4, 35.4, 55.9, and 80.1; lot 5, 38, 65.9, and 78.5; and lot 6, 34.7, 65.3, and 84.3. There was very little variation in production and also in feed consumption except in lot 6, where the amount of food eaten was rather low.

Quality of the egg as influenced by sunshine, cod-liver oil, germinated oats, alfalfa leaf meal, and mineral supplement.—Chicks hatched from eggs produced by hens on the above rations were fed eggs from the same lots in addition to a basal ration. When about one-half of the chicks showed unmistakable signs of leg weakness the experiment was discontinued. There was no appreciable difference in rate of growth or resistance to leg weakness except in lot 6, and even here the difference was slight.

The value of rice by-products for laying hens.—A check lot of 14 pullets was fed for 120 days on a ration in which the scratch feed consisted of yellow corn and whole wheat and the mash of wheat bran and shorts, yellow corn meal, oat flour, and meat scraps 1:1:1:1:0.5. In three similar pens brewer's rice replaced the corn in the scratch ration. The mash fed in lot 2 consisted of rice polish, rice bran, oat flour, and meat scrap 1:1:1:0.5, in lot 3 the same as lot 2 with the addition of 2 per cent of cod-liver oil, and in lot 4 the same as lot 3 with the omission of the oat flour.

During a period of 120 days the average egg production was 78.9, 64, 85.5, and 86, and the feed cost per bird was 90, 74, 85, and 78 cts. in the respective lots. This work indicates that the substitution of rice by-products for corn was profitable when cod-liver oil was used as a supplement.

[Experiments with poultry at the Washington Station] (*Washington Col. Sta. Bul. 229 (1928), pp. 41–43*).—Results of three experiments which have been continued from a previous report (E. S. R., 56, p. 567) are noted.

Breeding and selection, J. S. Carver.—The 126 White Leghorn hens used in the 1928 breeding work had an average egg production of 288.46, and over 66 per cent of the birds laid 280 eggs or more. The males used were selected from hens laying from 285 to 337 eggs. The average egg production for 80 Rhode Island Red hens was 241.85, and 41 of these birds laid from 240 to 307 eggs. Of the hens used 83 per cent were nonbroody. The males used were from hens laying 250 eggs or more.

Relation of date of sexual maturity to annual egg production with Rhode Island Reds.—Over a period of three years no correlation was found to exist between the number of days of sexual maturity and annual egg production of Rhode Island Reds. Of the birds having high egg records a large percentage matured between 200 and 230 days of age. Environmental conditions during the growing period appeared to govern the correlation between rate of maturity and early egg production.

Value of various proteins and combinations of them for laying pullets, L. W. Cassel.—In these comparisons it was found that liquid sour skim milk produced the highest average number of eggs per pullet. Powdered milk or meat meal as the sole source of protein was inefficient. A ration containing 16 per cent alfalfa leaves and 8 per cent fiber was also inefficient. A supplement of meat meal 4 per cent and skim milk powder 7 per cent was efficient but uneconomical, while a supplement of 10 per cent meat meal and 2 per cent skim milk powder was fairly efficient and fairly economical, but the most efficient and economical combination of these two products was 6 per cent of each. It was found that altalfa leaves and blossoms could be effectively substituted for green feed.

Missouri State Poultry Association Year Book, 1926, T. W. Noland (*Mountain Grove: Missouri State Poultry Assoc., [1927], pp. 87*).—The usual report of the material of popular interest is presented (E. S. R., 55, p. 265).

A study of the comparison of barley and wheat as constituents of the scratch grain, E. B. Lomax (*Harper Adams Util. Poultry Jour., 14 (1928–29), No. 2, pp. 67–70, figs. 2*).—An experiment was conducted at the Harper Adams Agricultural College, England, to compare the value of wheat and barley in the scratch ration of pullets. Two lots of 40 April-hatched White Leghorn pullets each were housed, managed, and fed for 48 weeks in an identical manner with the exception that barley replaced wheat in the scratch grain of 1 lot.

No statistically significant differences were found between the lots in number of eggs produced, size of eggs, body weight, molt, health and mortality, and in return per bird. With the exception of the first 4 weeks, the birds fed barley consumed more total feed than did the birds fed wheat. The average daily consumption of feed was 3.88 oz. in the barley lot and 3.62 oz. in the wheat lot. The author concludes that little or no difference exists in the value of wheat and barley when used in the scratch portion of the ration.

Cod-liver oil for chicks, C. W. Edwards (*Guam Sta. Rpt. 1927, p. 4*).—Chicks 1 week old at the beginning of the test were confined indoors for 11 weeks without exposure to direct sunlight. One lot of 37 chicks received a standard chick ration to which was added 2 per cent of cod-liver oil, while a second lot of 50 chicks received 5 per cent of cod-liver oil. All chicks made fairly satisfactory growth, and no cases of leg weakness appeared.

The first year egg production of Barred Plymouth Rocks, V. S Asmundson (*Sci. Agr., 9 (1928), No. 2, pp. 90–102, figs. 3*).—This is a study based on the trap-nest records of 569 Barred Plymouth Rock pullets hatched, housed, fed, and handled as previously noted (E. S. R., 60, p. 566) at the University of British Columbia.

The mean annual egg production of all birds for the 6 years of the study was 198 eggs, the production increasing from 187 eggs in 1920–21 to 206 eggs in 1925–26. The proportion of pullets that laid 225 or more eggs increased from 16.1 per cent to 32.6 per cent during the period of the test, while there was a corresponding decrease in the proportion of birds laying under 225 eggs. The increase in egg production was distributed over the period from January to October, inclusive, with the greatest increases occurring during the first three and the last two months. Variations in annual production apparently did not change during the 6 years, but variations did occur in monthly production, being least in March, April, and May and greatest during the four winter months and in October.

The variation in annual egg production according to the date laying commences, A. J. G. and W. A. Maw (*Sci. Agr., 9 (1928), No. 4, pp. 201–208, figs. 2*).—In this study the annual egg production records of 5,324 Barred Plymouth Rock pullets trap nested under the Canadian Record of Performance plan during the years 1923–24, 1924–25, and 1925–26 were used. It was found that there was no significant difference in the mean annual egg production of birds that started laying in either September, October, or November. The drop from 180.38±0.727 for birds which started to lay before November 30 to 167.88±0.752 eggs per bird for those which started to lay after December 1 is, however, deemed quite significant. There were also distinct differences in the mean egg production of birds from the various provinces according to the month laying began. The percentage of birds laying eggs under 2 oz. in weight was greatest for those beginning to lay in September and least for those beginning to lay in January. These percentages were 46 and 28, respectively.

Culling for egg production, N. R. Mehrhof (*Fla. Univ. Agr. Ext. Bul. 47 (1926), pp. 12, figs. 13*).—A popular publication designed to assist the practical poultryman as to when and how to cull his flock.

Poultry breeding records, G. Robertson (*Canada Dept. Agr. Bul. 103, n. ser. (1928), pp. 24, figs. 22*).—The purpose of breeding records for poultry, illustrations of charts and detailed explanations of their use in pedigree breeding. and methods of marking birds for identification are presented in this publication.

Artificial lights for late hatched Leghorn pullets, R. T. Parkhurst (*Harper Adams Util. Poultry Jour., 13 (1927–28), No. 12, pp. 629–632, figs. 2*).—In an effort to determine the effect of artificial illumination for increasing the egg production of late-hatched pullets, 2 lots of 120 White Leghorn pullets each, hatched May 10, were fed and housed in an identical manner at the Harper Adams Agricultural College, England. One lot was equipped with electric lights turned on to give an average 12-hour day from October 28 to March 27. The other lot received no artificial light.

In this study the late-hatched birds proved profitable, but due to the small size of the eggs laid the returns were less than from birds hatched earlier in the year. The lighted lot had a higher production level and gave greater profits over feed and lighting cost than did the birds in the unlighted lot. Lights had no injurious effect upon the health of the birds, and during the period of lighting the body weight of birds increased markedly over those in the unlighted lot. Feed consumption was markedly increased by the use of lights.

Turkey production, L. E. Cline (*New York: Orange Judd Pub. Co.; London: Kegan Paul, Trench Trubner & Co., 1929, pp. XVI+301, figs. 93*).—A practical treatise dealing with the origin, care and management, feeding, breeding, dressing, and marketing of turkeys, together with a popular discussion of the cause and control of some of the more common ailments.

DAIRY FARMING—DAIRYING

The Bureau of Dairy Industry: Its history, activities, and organization, J. Cameron (*Inst. Govt. Research, Serv. Monog. U. S. Govt. No. 55 (1929), pp. IX+74*).—This monograph gives a history of the establishment and development of this bureau, its functions, organization, the character of its plant, a compilation of the laws and regulations governing its operation, financial statements for several years, and a bibliography.

Feed, care, and management of the dairy cow, J. S. Moore (*Mississippi Sta. Bul. 259 (1928), pp. 15, fig. 1*).—A popular publication on the selection, feeding, and management of dairy cattle under Mississippi farming conditions.

Feeding dairy cows, A. R. Merrill (*Conn. Agr. Col. Ext. Bul. 123 (1928), pp. 35, figs. 4*).—A popular publication designed to give information of value to dairymen on the feeding of dairy cows.

[Experiments with dairy cattle at the Arkansas Station] (*Arkansas Sta. Bul. 231 (1928), pp. 33–35, 36–38*).—The results of experiments in continuation of those previously noted (E. S. R., 58, p. 362) are reported.

Value of legume hay for dairy heifers, H. E. Dvorachek.—In comparing legume and grass hays for growing stock, 6 Holstein and 3 Jersey heifer calves, averaging 5 months of age, were divided into 3 lots. Lot 1 received a ration of alfalfa hay fed at the rate of 1 lb. per 100 lbs. of live weight, and lots 2 and 3 mixed timothy and prairie hay fed at the same rate. All lots received 5 lbs. of skim milk per 100 lbs. of live weight. In addition lot 1 received ground brewer's rice and white corn chops, equal parts, with 1 per cent of salt added; lot 2 ground brewer's rice, white corn chops, linseed oil meal 10:10:5, with 3 per cent of minerals; and lot 3 the same as lot 2 except that 2 per cent of cod-liver oil was added. Each calf was fed and measured individually every 14 days.

The calves receiving alfalfa hay made the smallest gains and were least economical in the use of their feed, but no apparent difference in the condition of any lot was noticeable. When sufficient minerals and vitamins were provided from other sources, grass hay was apparently equal to alfalfa hay and even when no vitamins were added the gains on grass hay were equal to those on alfalfa hay.

Value of rice by-products for dairy cows, H. E. Dvorachek and M. S. Libbert.—In studying the effect of rice by-products on the physical and chemical properties of butterfat, 11 Holstein cows were each fed rations containing different percentages of rice polish and cottonseed meal, together with alfalfa hay, corn silage, salt, and minerals. The feeding was begun January 10, and on March 24, April 14, and May 12 the butterfat of the milk from each cow was separated and analyzed both chemically and physically. The results indicate that the feeding of rice polish increases the percentage of glycerides of low molecular weight in the butterfat, raises the saponification number at least temporarily, and decreases the percentage of fatty acids. Introducing cottonseed meal did not lower the refractive index of the butter, but did decrease the percentage of volatile fatty acids.

[Experiments with dairy cattle at the Washington Station], E. V. Ellington and J. C. Knott (*Washington Col. Sta. Bul. 229 (1928), pp. 24, 25*).—The results of three experiments in continuation of those previously noted (E. S. R., 59, p. 73) are reported.

Influence of methods of milking on quality and quantity of milk produced.—In this study no uniform increase in milk or butterfat production was observed due to massaging the udder either before or after milking or both. Further work substantiates the conclusion that alternate milking of the halves of the udder does not affect production.

Relationship of the physical characteristics of the cow's mammary system to production.—It was found that variations in percentage of butterfat or solids-not-fat from different quarters of the udder were not great. More variation was found over a two-day period in the same quarter than between the quarters.

A comparison of herring meal and soy bean meal for milk production.—Feeding trials showed little difference in the value of herring meal and soy bean meal either in the number of pounds of feed consumed per pound of butterfat or per 100 lbs. of milk produced. The herring meal had a moisture content of 5.44 per cent, kept without becoming rancid, and did not possess a strong odor, and cows ate it with apparent relish. No off flavors were noticed in the milk that could be traced to the feeding of herring meal.

Influence of ultra-violet ray upon the milking cow, K. Iguchi and K. Mitamura (*Jour. Facult. Agr., Hokkaido Imp. Univ., 24* (*1928*), *No. 2, pp. 39–60, pls. 3*).—This study at the Hokkaido Imperial University is divided into three parts. The experiment reported in part 1 was a study of the influence of ultra-violet light when irradiated upon the rear and two sides of the udders of two cows for 30 minutes daily at a distance of 25 cm. for a period of 9 days. A quartz mercury vapor lamp was used in this test. It was observed that the irradiating process was quite soothing to the cows and that they ruminated slowly during the periods. The light also had a stimulating effect upon production. Cows so treated showed an increase of 4.77 per cent in the amount of milk and 8.73 per cent in the amount of butterfat produced over cows not treated. The treatment was also favorable to increases in body weight.

The experiment reported in part 2 shows that when the concentrated portion of the cow's ration was irradiated for 1.5 hours per day at a distance of 60 cm. there was an increase of 2.92 per cent in the amount of milk and 4.24 per cent in the amount of butterfat produced. If, however, the corn silage in addition to the concentrates was irradiated, there was an increase of 28.4 per cent of milk and 15.9 per cent of butterfat.

The third experiment is a chemical analysis of the CaO and P_2O_5 salts of the milk. This study showed that there were no differences in the amounts of these salts in the milk that could be attributed to the irradiation of the udder.

The variations in milk yields caused by season of the year, service, age, and dry period, and their elimination.—Part III, Age, H. G. Sanders (*Jour. Agr. Sci.* [*England*], *18* (*1928*), *No. 1, pp. 46–67, figs. 13*).—Continuing this study (E. S. R., 59, p. 572), curves are presented in section A for corrected lactations of individual cows, corrected according to date of calving and to service period. These curves indicate that as age increases the milk yield increases up to the sixth lactation, and then decreases at practically the same rate until the yield at the eleventh lactation is approximately the same as at the first lactation. It was found that the mongrels and Lincoln Reds reached their maximum production at about the sixth lactation, the Red Polls at the seventh, and the Friesians at the eighth. Of these breeds, the yield data for the mongrels agree most closely with those of all cows. Since the records for some of the breeds are based on a small number of individuals and since more variations have been found between individuals within a breed than between the breeds, the author does not recommend a different set of correction factors for each breed, preferring the factor for all breeds as being the more accurate.

A comparison of high and low yielders showed that the former averaged approximately 20 per cent more milk in the fourth lactation than in the first, while the latter averaged 50 per cent more. This difference may be due to a nutritional factor operating on the high yielders or to the fact that the low yielders increased abnormally after the first lactation, which represented a deviation below their real value, while the high yielders may have been above their real level at the first lactation.

In section B the variation in the shape of the lactation curve with age is presented. Up to the seventh lactation there is a continuous picture of the variation, which seems to depend on two factors. "As age increases the level at which the lactation commences rises, but the increase in total yield is not proportionate to this rise, as it is tempered by the 'persistency factor' diminishing; the rise in the initial yield gradually slows down, and from the sixth to the seventh lactation it is insufficient to compensate for the drop in persistency." This variation does not continue in the next stage. It is possible that the initial yield may depend upon the area of the gland available for milk secretion, and if this is true it appears that the gland grows rapidly at first and then slows down in rate of growth but maintains an increase to the seventh lactation. It is supposed that decline in yield is influenced by nutrition or may be due to senile changes in the gland itself. At any rate, the two factors seem to be closely related.

Milk and its products, V. M. PERAZA (*La Leche y Sus Productos. Madrid: Bruno del Amo; Habana: "Cultural," 1928. pp. 459, pls. 5, figs. 166*).—A practical treatise dealing with the composition and sanitary production of milk; the making of butter and cheese; and the feeding, breeding, and management of dairy cattle.

Dairy bacteriology, B. W. HAMMER (*New York: John Wiley & Sons; London: Chapman & Hall, 1928, pp. XII+473, figs. 47*).—A treatise for students in dairy industry, dealing with the examination and determination of bacteria in milk, cream, butter, ice cream, and cheese.

Outlines of dairy bacteriology, H. L. RUSSELL and E. G. HASTINGS (*Madison, Wis.: H. L. Russell, 1928, 12. ed., pp. IX+238, figs. 64*)—This is a revised edition of this treatise, previously noted (E. S. R., 6, p. 482).

Enumerating bacteria by the plate-count method, W. R. ALBUS (*Milk Dealer, 18 (1929), No. 5, pp. 55–57, fig. 1*).—In this article from the U. S. D. A. Bureau of Dairy Industry the author discusses some of the possible sources of discrepancies that have been reported in plate counts of bacteria of milk. Experimental evidence is introduced to show the possible effect on plate counts of the factors time, temperature, and growth. It is the aim of this paper to point out that while bacterial enumeration is a method of approximation, when conscientiously used by trained personnel it can and does give consistent counts when all possible sources of error are controlled.

A milk-fermenting yeast, C. S. RAM AYYER (*Agr. Research Inst., Pusa, Bul. 183 (1928), pp. 5, pls. 2*).—This paper from the Agricultural Research Institute, Pusa, India, describes a yeast isolated from a can of spoiled sterilized milk which resembles *Torula lactis* in several cultural and other characteristics but differs from it in size of cells and in thermal death point. This yeast ferments the lactose of milk into alcohol, producing 20 gm. of alcohol from 1,000 cc. of milk. It also ferments whey but does not act on maltose. In milk and most sugar media this yeast produces vigorous gas formation.

Effects of agitation on the cream layer of milk, J. H. ERB (*Milk Dealer, 18 (1929), No. 5, pp. 53, 54, figs. 9*).—In this study by the U. S. D. A. Bureau of Dairy Industry both raw and pasteurized milk were agitated in a 50-gal. glass-lined vat for two or more hours. Samples of milk were taken before agitation and about every 30 minutes during agitation. The samples were placed in 500 cc. graduated cylinders and readings of the cream layer made after standing 24 hours.

It was found that agitation at temperatures between 42 and 100 or 105° F. caused a loss of depth of cream volume. The skim milk of such samples tested higher and the cream layer lower for butterfat than in samples that were not agitated. The size of the fat globules was practically the same before and after agitation. However, there was a marked coalescing of the globules after agitation, which resulted in less exhaustive creaming. Agitation at temperatures ranging from 100 or 105 to 144° had no effect upon the cream layer. Heating milk that has had its creaming ability impaired to 140° momentarily may restore its normal cream layer.

A study of various neutralizers and their effect on the butter, M. S. LIBBERT (*Arkansas Sta. Bul. 231 (1928), pp. 44–46*).—Continuing the comparison of neutralizers (E. S. R., 58, p. 365), it was found that from four to seven times more soda solution than lime mixture was required to neutralize the same percentage of acid in cream. Cream that had been neutralized with soda solutions separated into two layers, a lower layer of clear serum and an upper layer of cream. This action became apparent after 45 minutes' standing and was generally complete in 2 hours. Such cream when stirred returned to an apparently normal condition. No such separation occurred when lime neutralizers were used.

A series of eight churnings was made in which each of 10 commercial neutralizers was used and the resulting butters scored while fresh and at the end of 90 days' storage at 0° F. The variation in the scores of the control butter and butter made with soda neutralizers was 1.38 points with the fresh butter and 0.7 point with the stored butter. With the lime neutralizers the differences were —0.22 and 0.99, respectively. However, there was a difference of not over 0.11 point in the scores of butters made with lime and soda neutralizers.

A rapid method for determining the mould and yeast count of butter, C. K. JOHNS (*Sci. Agr., 8 (1928), No. 6, pp. 353–368, pl. 1, figs. 4*).—A modification of the Frost method (E. S. R., 36, p. 573), known as the microplate method, is described in this paper from McGill University, Canada. This method permits bacterial counts to be made in from one-seventh to one-tenth of the time required by the standard plate method.

When the mold content of butter is above 100 per cubic centimeter the microplate method gives reasonably accurate counts, and up to 50,000 molds and 1,000,000 yeasts per cubic centimeter may be obtained from 1 : 5 dilutions. A frequency distribution of the ratios of the counts obtained by the microplate method to the standard plate method shows a close grouping around the modal value of 2 : 1. In comparing the yeast counts obtained by the two methods a greater variation was found, but in 74.6 per cent of the samples analyzed a satisfactory relationship was found to exist.

This method in addition to its time-saving feature is more economical than the standard plate method in the amount of glassware, media, and equipment needed, and it can also be adapted to field work.

Contaminated water as a source of surface flavor in pasteurized creamery butter, D. B. SHUTT (*Sci. Agr., 9 (1929), No. 5, pp. 316–320*).—Samples of water were obtained from two creameries troubled with surface flavor in their butter by the Ontario Agricultural College and analyzed by plating with milk powder agar of pH 6.8 reaction and incubated at 25° C. for 4 days. The alkali-forming bacteria were isolated in pure culture. Special pasteurized unsalted butter was inoculated with these cultures and incubated at 25° for 28 days. The water tested was found to be contaminated with *Pseudomonas fluorescens*, which produced typical surface flavor in the inoculated butters.

Laboratory and field tests indicated that the following methods could be used for controlling this flavor: Substituting pure water for the contaminated water, heating the contaminated water to 190° F. for 10 minutes, and neutralizing the cream to not less than 0.35 per cent acid.

Metal corrosion and milk flavor, E. S. GUTHRIE and C. L. ROADHOUSE (*N. Y. Prod. Rev. and Amer. Creamery, 67 (1929), No. 9, pp. 416–418*).—Preliminary results of a cooperative study by the New York Cornell and the California Experiment Stations are reported in this paper. Strips of metal cut into pieces 1 by 2 in. were so arranged in glass containers that milk could pass completely around them. The containers were then exposed to milk for from 1 to 5 hours at room temperatures and for 1.5 hours during pasteurization. The strips of metal were weighed before and after exposure to the milk, and the milk itself was stored at 34° F. and examined at different stages of the holding period. The detailed results obtained to date are presented in two tables.

Tinned plate (properly tinned and not worn off), aluminum, and the chromium metals, such as endure steel and superascoloy or allegheny metal, were found to lose little or no weight in the milk and did not impart a metallic or other objectionable flavor.

Some observations on the bacterial content of dried milk, H. Macy (*Jour. Dairy Sci., 11 (1928), No. 6, pp. 516–526*).—Data are reported on the bacterial content of 31 samples from various sources of dried milk prepared by the spray process and 13 by the drum process before and after storage periods up to six years.

The bacterial counts of the spray-process samples were much higher than of the drum process, the former ranging from 4,400 to 5,500,000 per gram, with the majority at 50,000, and the latter from 40 to 7,900 per gram, with the majority less than 500. Both types showed a remarkable decrease in count after storage at room temperature for one year, the decrease being greater for the spray than the drum-process samples. A comparison of the extent of production of bacteria at temperatures of 5, 10, 20, and 37° C. showed greater reduction at the higher temperatures for the spray-process samples and no great differences in the drum-process samples.

The bacteria in the drum-process samples were chiefly of the peptonizing type and in the spray-process samples of the acid-producing type.

VETERINARY MEDICINE

[Report of the division of veterinary science of the Washington Station], J. W. Kalkus and C. E. Sawyer (*Washington Col. Sta. Bul. 229 (1928), pp. 43, 44*).—In control work with contagious abortion, the application of the agglutination test periodically and the segregation of the positive and negative cows into two groups on the basis of the test, as outlined in the bulletin previously noted (E. S. R., 54, p. 870), continued to meet with success in the herd at the Western Washington Experiment Station. This is the fifth year since this method of control was instituted in the herd and in no case has *Brucella abortus* occurred in the negative herd. In the reacting herd there remained one naturally infected cow, which after aborting for two successive years has produced five normal calves in as many years. Placental membranes which were expelled normally were negative for *B. abortus*. The serum from this cow continues to be positive to the agglutination test, and milk from all quarters of the udder consistently contains live abortus organisms.

In further work with dyes injected intravenously for the purpose of destroying abortion organisms in the udder, previously noted (E. S. R., 59, p. 76), all seven cows in the positive herd were given this treatment. Milk from all cows except one was positive for abortus organisms 6 weeks previous. The milk of the one cow remained negative during the experiment. Samples of milk which were taken from each cow 2 days, 9 days, and 6 weeks after intravenous injection of the neutral acriflavine were centrifuged and injected into guinea pigs. The naturally infected cow and one artificially infected cow continued to harbor organisms in the udder when the third sample of milk was taken. Milk from the other four artificially infected cows contained abortus organisms 2 and 9 days after dye treatment, but became negative before the sample was taken at the end of the 6 weeks' period.

Experimental work in feeding oxalic acid to heifers suffering from red water, commenced the previous year (E. S. R., 59, p. 76), was continued without indication that the disease can be artificially produced in this way.

Report of Third Scandinavian Veterinary Congress (*3. Nordiske Veterinaermøte, Oslo, 1928. Beretning. Oslo: Kølbelske Bok- og Kunsttrykkeri, 1928, pp. 1021, pls. 17, figs. 69*).—The contributions on diseases of livestock and means for their control presented at the meeting held at Oslo July 9–12, 1928, include the following:

The Control of the Foot-and-Mouth Disease by the Stamping-out Method, by G. Kjerrulf (pp. 50–63, Eng. abs. pp. 57, 58); The Foot-and-Mouth Disease in Norway, 1926–1927, by N. P. Thorshaug (pp. 63–92, Eng. abs. pp. 90–92); Foot-and-Mouth Disease: Viability and Plurality of Types of Virus, by H. Magnusson (pp. 92–119, Eng. abs. pp. 118, 119); A Contribution to Our Knowledge of the Hog-Cholera Epidemic in Sweden in 1926 and 1927, by O. Brandt (pp. 120–148, Eng. abs. pp. 146–148); The Control of Hog Cholera by Means of Immunizing, by E. Lehnert (pp. 148–161, Eng. abs. pp. 160, 161); Treatment of and Prophylactic Inoculation against Piroplasmosis, by H. Heijbel (pp. 166–178, Eng. abs. pp. 176–178); Experimental Piroplasmosis, by E. Klarin (pp. 178–191, Eng. abs. p. 191); Vaccination against and the Treatment of Piroplasmosis of Cattle, by R. Hindersson (pp. 192–209, Eng. abs. pp. 207–209); Puerperal Hemoglobinuria in Bos, by J. Ekelund (pp. 215–243, Eng. abs. pp. 232–234); The Pathological Anatomy and Etiology of Puerperal Hemoglobinemia, by A. Hjärre (pp. 243–258, Eng. abs. pp. 257, 258); The Control of Infectious Abortion in Cattle by the Help of Blood Tests and Treatment with Bacterins, by S. Wall (pp. 369–392, Eng. abs. pp. 384, 385); On the Fight against Infectious Abortion by Means of Systematic Blood Examination Combined with Isolation and Disinfection, by A. Thomsen (pp. 392–411, Eng. abs. pp. 410, 411); Diminished Fertility in Our Domestic Animals, by H. Stålfors (pp. 433–452, Eng. abs. pp. 451, 452); Genetic Factors Influencing the Fertility in Domestic Animals, by P Tuff (pp. 452–468, Eng. abs. pp. 467, 468); Treatment of Intravaginal Inguinal Hernia in Horse, by A. W. Mørkeberg (pp. 481–501, Eng. abs. pp. 499, 500); Some Remarks on the Practical Therapeutic Shoeing of Horses, Based on the Loading and Supporting Theories, by A. Pålman (pp. 506–527, Eng. abs. pp. 525–527); Outline of the Milk Control in Copenhagen during 40 Years, by St. Friis (pp. 582–601, Eng. abs. pp. 600, 601); Diagnosis and Combating of Mastitis in Cows, by O. Skar (pp. 613–634, Eng. abs. pp. 633, 634); Etiology in Cases of Poisoning in Domestic Animals, by L. M. Slagsvold (pp. 753–776, Eng. abs. pp. 775, 776); The Effect on the Clinical Composition of the Blood Caused by Feeding Animals on Beet Tops, by O. Carlens (pp. 777–791, Eng. abs. p. 790); Parasitic Diseases in Sheep, by S. Tillier (pp. 827–835, Eng. abs. pp. 834, 835); Bovine Tuberculosis Control, by B. Bang (pp. 836–857, Eng. abs. pp. 856, 857); The Value of the So-called Ostertag Method for Combating Tuberculosis in Cattle, by G. Regnér (pp. 858–869, Eng. abs. p. 869); Clinical Investigations as Complementary to Tuberculin Investigations in Accordance with the Bang Method, by S. Jerlov (pp. 869–897, Eng. abs. pp. 883, 884); Measures Taken by the State to Combat Tuberculosis in Cattle in Norrland, by H. Dahlström (pp. 897–917, Eng. abs. pp. 914–917); Diagnosis of Bovine Tuberculosis, by H. Tallgren (pp. 917–934); and Combating of Tuberculosis in Norwegian Livestock, by H. Holth (pp. 935–966, Eng. abs. pp. 953–955).

Veterinary Service annual report 1923–1924, A. E. BRANCH ET AL. (*Egypt Min. Agr., Vet. Serv. Ann. Rpt. 1923–24, pp. VI+79, pls. 5*).—The first part of this report (E. S. R., 54, p. 674) deals with the diseases of animals, particularly rinderpest, with a report on the work of the pathological laboratory, and part 2 with work at the Serum Institute, by D. S. Rabagliati.

Annual report of the Veterinary Department, Northern Provinces, for the year 1927, W. W. Henderson et al. (*North. Provs. [Nigeria] Vet. Dept. Ann. Rpt. 1927, pp. 54, pls. 15*).—In this report the several sections on special diseases deal with those of cattle, particularly rinderpest (pp. 8–21), of equines, of sheep and goats, and of dogs.

Annual report of the Department of Veterinary Science and Animal Husbandry for the years ending 31st December, 1927, F. J. McCall (*Tanganyika Ter. Dept. Vet. Sci. and Anim. Husb. Ann. Rpt. 1927, pp. 45*).—This is the usual annual report (E. S. R., 59, p. 470), the second part of which, by S. A. Evans, deals with the veterinary pathological work at Mpwapwa.

Relation of *d*-gossypol to the toxicity of some cottonseed products, W. D. Gallup (*Indus. and Engin. Chem., 20 (1928), No. 1, pp. 59–63*).—This is a contribution from the Oklahoma Experiment Station, in which the author finds that the toxicity of cottonseed meal may be due not only to the presence of ether-soluble gossypol as it is found in cotton seeds, but also to the presence of what appears to be a decomposition product formed during the heating of the seeds previous to expressing the oil and given the name *d*-gossypol.

"The toxicity of the meal studied was not reduced by removal of the small amount of ether-soluble gossypol which it contained, nor was this form of gossypol present in sufficient amounts to produce toxic symptoms in animals when the extract was fed in excessive quantities. When the meal is heated in the presence of moisture, as in autoclaving, it loses its toxic properties, although it may still contain a small amount of *d*-gossypol. Although cotton seeds are extremely toxic, they also may be rendered nontoxic by autoclaving in a wet condition. By heating the seeds for a short time in a dry condition the gossypol becomes partially converted to the insoluble form and a separation made of the two by extraction with ether. The insoluble gossypol so produced is much more toxic than the insoluble form found in cottonseed meal or in seeds which have been subjected to steam heat. The determination of *d*-gossypol by the present chemical methods is not a safe criterion for estimating the toxicity of cottonseed products."

Parasites in association with malignant growths, J. Drabble (*Aust. Vet. Jour., 4 (1928), No. 4, pp. 122–126, fig. 1*).—Attention is called to the fact that anything which is capable of causing chronic irritation or inflammation is a potential factor in the etiology of cancer.

Anaphylactic experiments with extracts of liver fluke (Fasciola hepatica), C. H. Kellaway (*Aust. Jour. Expt. Biol. and Med. Sci., 5 (1928), No. 4, pp. 273–283, figs. 2*).—The author finds that there are two "antigenic substances in extracts of fluke, one present in saline extracts, which though heat stable shows a decreasing solubility in increasing strengths of alcohol and is a true anaphylactic antigen, and another, probably a lipin, soluble in absolute alcohol and capable of sensitizing guinea pigs but not of discharging the sensitiveness of the sensitive plain muscle. The latter substance may possibly be identical with the antigen responsible for complement fixation."

Cultural features of the anthrax bacillus as related to morphology and pathogenicity, S. J. Schilling and W. L. Bleecker (*Arkansas Sta. Bul. 231 (1928), pp. 76–79, fig. 1*).—Investigations made of several spontaneously occurring variants of a pathogenic strain of the anthrax bacillus in which the morphology of the organism, cultural features on solid and in liquid media, and pathogenicity were studied are reported on, as are studies of the multiplication of *Bacillus anthracis* in the soil and of its nitrogen requirements.

I, Transmission of foot-and-mouth disease in rodents by contact. II, The spread of foot-and-mouth disease by rats, rabbits, and birds, J. M. Beattie, Z. Morcos, and D. Peden (*Jour. Compar. Path. and Ther., 41 (1928), No. 4, pp. 353–362, fig. 1*).—This is a report of studies conducted at the University of Liverpool, supplementing the three reports previously noted (E. S. R., 60, p. 268).

It appears that the ordinary white laboratory rat is resistant to infection with foot-and-mouth virus, but that the resistance is not absolute. Occasionally, white rats may become infected. This infectivity may not show itself by any characteristic lesion during life, but is transmissible by artificial inoculation to other animals. The work indicates that rats may be carriers of the disease. Rats, especially wild rats, and rabbits can become infected and may show characteristic lesions provided there is an abraded surface to which the virus may be applied. These abrasions are extremely common among wild rats, and in an examination of rats which come regularly to the laboratory from ships and from sewers and warehouses the authors have found anywhere from 20 to 40 per cent with definite abrasions.

Disinfection in foot-and-mouth disease, F. C. Minett (*Jour. Compar. Path. and Ther., 41 (1928), No. 4, pp. 298–317*).—This is a somewhat more detailed account of observations than those recorded in the second and third progress reports of the Foot-and-Mouth Disease Research Committee, previously noted (E. S. R., 57, p. 77; 60, p. 268).

On the question of the immunity in bovine piroplasmosis [trans. title], W. L. Yakimoff (*Centbl. Bakt. [etc.], 1. Abt., Orig., 108 (1928), No. 7–8, pp. 438–449*).—This discussion is presented in connection with a list of 44 references to the literature.

The acclimatization of imported stock, J. T. Edwards (*Agr. Jour. India, 22 (1927), Nos. 5, pp. 333–338; 6, pp. 411–424, pl. 1, figs. 8*).—This discussion deals particularly with the method of protecting imported cattle against piroplasms, including Babesia and Theileria.

Rinderpest: Active immunization by means of the serum simultaneous method; goat virus, J. T. Edwards (*Jour. Cent. Bur. Anim. Husb. and Dairying, India, 2 (1928), No. 2, pp. 45–49*).—This account supplements the report noted above. The directions given for the application of this method of preventive inoculation have been noted (E. S. R., 54, p. 871).

Observations on rinderpest, R. Daubney (*Jour. Compar. Path. and Ther., 41 (1928), No. 4, pp. 263–297, figs. 19*).—This is in continuation of the article previously noted (E. S. R., 60, p. 370). It deals with the virus in the blood, attempted cultivation, artificial immunization, and field inoculations. A list of 34 references to the literature is included.

A single-injection method of immunization against rinderpest, E. A. Rodier (*Jour. Amer. Vet. Med. Assoc., 74 (1928), No. 1, pp. 42–48*).—This is an account of work conducted in the Philippine Islands based upon the studies noted from another source (E. S. R., 60, p. 477).

An improved vaccine for immunization against rinderpest, R. A. Kelser, S. Youngberg, and T. Topacio (*Jour. Amer. Vet. Med. Assoc., 74 (1928), No. 1, pp. 28–41, figs. 4*).—This account has been noted from another source (E. S. R., 60, p. 270).

Mercuric chloride as a diagnostic agent for trypanosomiasis in camels, S. C. J. Bennett and P. A. C. Kenny (*Jour. Compar. Path. and Ther., 41 (1928), No. 4, pp. 341–353*).—The experiments conducted show that dilute solutions of mercuric chloride are reliable for detecting *Trypanosoma soudanense* infection in camels when employed according to the technique described, namely, when 1 drop of serum is added to 1 cc. of 1:20,000 or greater dilution. A positive reaction is denoted by an opacity and a negative reaction by no change at the end of a quarter of an hour. This form of test appears to be more reliable than the formol-gel test.

The action of Vibrion septique and B. welchii toxin on isolated organs, G. A. H. Buttle and J. W. Trevan (*Brit. Jour. Expt. Path., 9 (1928), No. 4, pp. 182–198, figs. 9*).—The authors report upon studies of the action of *V. septique* and *B. welchii* toxins on involuntary muscle in vitro.

"The toxin of *V. septique* is shown to be destroyed by bubbling air oxygen or hydrogen through its solution. The action of *V. septique* toxin is shown to be reversible by washing with Ringer's solution and by adding a large amount of serum. The concentration of toxin-producing effects on smooth muscle in aerated Ringer's solution is shown to be of the same order as that in the blood of a rabbit receiving an average lethal dose. A small dose of *V. septique* toxin added to a bath of oxygenated Ringer's solution containing a piece of uterus renders the tissue insensitive to the action of larger doses of either *V. septique* or *B. welchii* toxin. The important part of the action of the two toxins is specific in that they are neutralized by the appropriate antisera and not by other antisera. There is a trace of nonspecific toxic material in both toxins. By using this effect titrations of antitoxin potency of sera have been carried out. Differences of 20 per cent of the sera in a neutralizing mixture can be determined. The end-point approximates closely to that given by the determination of L_+ dose in mice. Rabbits were immunized against *V. septique* toxin."

The pathogenicity of M. melitensis and B. abortus for the monkey and man [trans. title], E. Burnet (*Compt. Rend. Acad. Sci. [Paris], 187 (1928), No. 13, pp. 545–548; trans. in Cornell Vet., 19 (1929), No. 1, pp. 65–67*).—Reference is made to earlier experimental inoculations which led to the conclusion (1) that the *Brucella abortus* worked with is distinguished from *B. melitensis* by the absence of any pathogenic effect upon the monkey or man, and (2) that a living *B. abortus* virus vaccinates both the monkey and man against *B. melitensis.*

The experiments were repeated with cultures isolated from cattle and man and are considered to confirm the conclusion arrived at in 1923 (E. S. R., 49, p. 881). The subcutaneous inoculation of Macacus monkeys with 30,000,000 and man with 200,000,000 of the organism isolated within 1 or 2 months from bovines did not produce undulant fever. Even a strain isolated from a human case of undulant fever due to *B. abortus* failed to produce the disease. That there are differences between the natural and experimental disease is recognized. It is suggested that there may be types of this organism with adaptable characteristics which cause both abortion in the cow and undulant fever in man.

Thermoagglutination and the evolution of Brucella species [trans. title], E. Burnet (*Arch. Inst. Pasteur Tunis, 17 (1928), No. 2, pp. 128–146*).—The author's experimental study of thermoagglutination, together with epidemiological observations and experimental work with Brucella, epizootic abortion, and undulant fever, are considered to favor the following hypotheses: (1) That *B. abortus* is the primitive type of Brucella from which *melitensis* and *paramelitensis* are derived, and (2) that the development of *abortus*, nonpathogenic for man, into *melitensis* and *paramelitensis* pathogens takes place in the goat.

Some observations on the pathogenicity of different strains of the Brucella group of organisms, S. H. McNutt (*Jour. Amer. Vet. Med. Assoc., 74 (1928), No. 1, pp. 94, 95*).—The author finds that strains of Brucella from bovine sources usually produce rather mild lesions in the spleen and liver and rarely affect the testes, injected animals perhaps being more apt to live than to die as a result of injection. Strains from swine were markedly more pathogenic, always producing pronounced lesions in the spleen and liver, and often in the testes. Injection of guinea pigs with strains of porcine origin nearly always resulted in death.

Bovine infectious abortion and its relationship to public health, C. A. Mitchell (*Canad. Pub. Health Jour., 20 (1929), No. 2, pp. 78–84*).—Included in this discussion is an account of the pathology of *Brucella abortus* (Bang) infection of cattle and the importance of the live vaccine.

Undulant fever in Ontario, A. L. McKay and A. L. McNabb (*Canad. Pub. Health Jour., 20 (1929), No. 2, pp. 85–91*).—Fourteen cases of undulant fever (Bang), in which laboratory and clinical findings agree as to diagnosis, are reported upon. These cases are said to have been discovered within five months in one laboratory.

The reliability of the agglutination test for the diagnosis of contagious abortion in cattle, J. McFadyean (*Jour. Compar. Path. and Ther., 41 (1928), No. 4, pp. 362–369*).—The author reviews the findings of Holtum (E. S. R., 60, p. 271), questions some of the findings there reported, and briefly summarizes the results which he himself has obtained since 1914 by application of the agglutination test for diagnosis in infected herds with a view to the eradication of the disease. He concludes that a method which enables the making of a positive diagnosis in from 7 to 14 days after infection by the mouth, vagina, or prepuce, sets a very high standard of usefulness. It is pointed out that in some of the cases reported a test might have been successfully carried out before the seventh day.

Contagious abortion: A discussion on the failure of abortion disease control. W. L. Williams (*North Amer. Vet., 9 (1928), No. 12, pp. 17–31*).—A practical discussion of the problem.

Pathological alterations observed in cattle fed on special rations, A. L. Delez (*Jour. Amer. Vet. Med. Assoc., 74 (1929), No. 2, pp. 227–237, figs. 10*).—In work at the Michigan Experiment Station animals fed on milk and grain rations with various supplements showed lesions in the liver and kidneys that were acute, subacute, and chronic in nature. "Convulsive symptoms are more violent and common in milk-fed animals. The pathological picture in many cases indicates that death is due to acute intoxication. Blindness is observed in two cases fed on rations of grain with cottonseed meal and wheat straw. Microscopical examination reveals definite lesions in the optic nerve of both cases."

The anaplasmosis of bovines in Russia [trans. title], W. L. Yakimoff, Mrs. E. F. Rastégaïeff, Mrs. A. N. Tolstoff, and S. N. Nicolsky (*Bul. Soc. Path. Exot., 21 (1928), No. 8, pp. 642, 643*).—It is pointed out that anaplasmosis in Russia is caused by an organism, differing from *Anaplasma argentinum*, which was named *A. rossicum* by Yakimoff and Bélawine in 1926.

Contagious streptococcic mastitis of dairy cows, W. L. Hindmarsh (*Agr. Gaz. N. S. Wales, 39 (1928), No. 8, pp. 606–612*).—The author reports in detail upon the effect of streptococcic vaccine on cows affected with contagious streptococcic mastitis.

On the occurrence of black disease bacilli in the livers of normal sheep, with some observations on the causation of black disease, G. Edgar (*Aust. Vet. Jour., 4 (1928), No. 4, pp. 133–141*).—In work at the Veterinary Research Station, Glenfield, N. S. Wales, black disease bacilli (*Bacillus oedematiens*) have been isolated from the livers of apparently healthy sheep, but only in districts in which black disease is known to occur. It appears that only when destruction of the liver parenchyma occurs, such as by the entrance of immature fluke, is the organism able to multiply and exert its toxicogenic effect.

Blackleg in sheep, H. Marsh, H. Welch, and E. Jungherr (*Jour. Amer. Vet. Med. Assoc.*, *74* (*1928*), *No. 1, pp. 63–88*).—In work conducted by the Montana Experiment Station in cooperation with the Montana Livestock Sanitary Board, the authors found that true blackleg, caused by infection with *Clostridium chauvei*, occurs in sheep, and that blackleg in sheep is typically a wound infection. Following an original wound infection and the contamination of the premises with a strain of *C. chauvei* which has passed through sheep, the disease may occur without any evidence of wounds.

"Sheep become infected with blackleg from bovine sources when exposed to concentrated infectious material in the presence of wounds due to shearing, castrating, or docking. *C. chauvei* from ovine sources is morphologically, culturally, and serologically identical with *C. chauvei* from bovine sources. Strains of *C. chauvei* from sheep were consistently virulent for sheep, while two of five cattle strains studied were only slightly pathogenic for sheep. Satisfactory immunization against field infection was obtained by vaccination with 3 cc. of natural aggressin as prepared for cattle. Vaccination with natural aggressin, prepared from either cattle or sheep tissues, produced a severe reaction. Filtrates produced no shock. Vaccination with aggressin did not protect against doses of pure cultures of sheep strains greater than 2 or 3 m. l. d. Inoculation with a culture of a strain of *C. chauvei* of bovine origin, which was practically avirulent for sheep, produced complete immunity against 50 m. l. d. of pure cultures of sheep strains."

A list is given of 56 references to the literature.

Contagious pustular dermatitis of the sheep, R. E. Glover (*Jour. Compar. Path. and Ther.*, *41* (*1928*), *No. 4, pp. 318–340, figs. 6*).—This is an account of a disease of sheep frequently met with in Great Britain, chiefly as a disease of lambs. In the three outbreaks studied by the author it was possible to demonstrate the presence of filtrable virus in the lesions. Sheep and goats alone appear to be susceptible to this virus, which has a marked affinity for epithelial tissue. Under experimental conditions the lesions show a marked resemblance to those of the vaccinia-variola group in that they pass through the stages of papule, vesicle, pustule, and scab. In so far as the present investigation has been pursued, the strains of virus studied conform to a single type. The virus, which exists in great abundance in the lesions, is highly resistant to desiccation. It can be shown that, under experimental conditions, recovered animals possess a high degree of immunity, sufficient to protect them against reinfection for a period of at least eight months. It is suggested, therefore, that the preventive inoculation of flocks by means of a vaccine prepared from the dried and powdered crusts would be of value in the control of the disease in the field.

Tularaemia in sheep in nature, R. R. Parker and J. S. Dade (*Pub. Health Rpts.* [*U. S.*], *44* (*1929*), *No. 3, pp. 126–130*).—A report is given of eight sheep, including lambs and adults, found sick under natural conditions, in which the presence of *Bacterium tularense* was detected either by its culture or by application of the agglutination test.

Prevention and control of sheep parasites in Pennsylvania, H. W. Turner and J. G. Moon (*Jour. Amer. Vet. Med. Assoc.*, *74* (*1929*), *No. 2, pp. 199–204, fig. 1*).—The authors found the average age of infestation of lambs raised on contaminated pastures to be 4 months 12 days. It was determined that lambs 66 days old and weighing from 30 to 35 lbs. may be safely treated. Fecal examinations show a gradual increase in the number of eggs from May to August and then a gradual decline. While copper sulfate, Lugol's solution, and tetrachlorethylene may control stomach worms, it does not appear from the present work that their use will lead to eradication. Furthermore, these drugs do not appear to have any marked anthelmintic value that would warrant their use in flocks infested with nodular disease or lungworms.

Hemorrhagic septicemia with report of one outbreak in swine, M. F. BARNES and A. L. BRUECKNER (*Jour. Amer. Vet. Med. Assoc., 74 (1928), No. 1, pp. 95–98*).—In the outbreak of this disease of swine reported upon, 60 of the original 68 pigs died.

The susceptibility of weaned pigs to hog cholera, E. M. PICKENS, R. C. REED, M. F. WELSH, and L. J. POELMA (*Cornell Vet., 19 (1929), No. 1, pp. 17–24*).—The authors found that many weaned pigs, born of and suckled by immune mothers and not garbage fed, failed to withstand exposure to stock hog cholera virus from the ages of 31 to 78 days. They encountered wide variations in immunity, that is, the ability to withstand inoculation with 1 cc. of stock hog cholera virus, both of different litters and of individuals of the same litter.

It appears that the ages within the prescribed limits at which pigs of the kind described in the experiment were weaned bear but little relation to the incidence of hog cholera. The increase in the length of the interim between weaning and exposure to hog cholera virus in pigs within certain age limits, and of the kind previously described (E. S. R., 60, p. 479), seems to bear a rather direct relation to the increase in the incidence of hog cholera.

The study of the cells of the blood as an aid to the diagnosis of hog cholera, P. A. LEWIS and R. E. SHOPE (*Jour. Amer. Vet. Med. Assoc., 74 (1929), No. 2, pp. 145–152*).—This is a preliminary report, in which it is concluded tentatively that hog cholera is the only acute infectious swine disease characterized by a decrease in the number of white blood cells, and that this leucopenia is of such a profound degree as to be of diagnostic importance. It is believed by the authors that for the present and until contradictory evidence appears a leucocyte count of 8,000 per cubic millimeter or less on three sick animals in a suspected herd indicates clearly that the condition is hog cholera.

A study of the simultaneous and serum-alone methods in the treatment of cholera-infected hogs, C. N. MCBRYDE and W. B. NILES (*Jour. Amer. Vet. Med. Assoc., 74 (1929), No. 2, pp. 153–170*).—The work here reported leads to the conclusion that "simultaneous treatment is not contraindicated in the treatment of cholera-infected hogs, regardless of whether their temperatures are above 104° F., and is to be recommended in the treatment of infected herds provided there are no secondary infections or complications. The curative value of anti-hog-cholera serum appears to diminish progressively with the lengthening of the period of infection, and after the lapse of four or five days from the time of actual infection the administration of serum is of little benefit even though large doses be given. In the later or more advanced stages of hog cholera, the curative value of serum appears to be no greater when given intravenously than when given subcutaneously."

The question of the pathogenicity of Bacillus suipestifer [trans. title], F. SCHMIDT (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 108 (1928), No. 5–6, pp. 276–279*).—The author reports upon 36 cases of acute toxic symptoms resulting from poisoning by this organism.

Bact. viscosum equi infection in a foal—104781, D. H. UDALL, M. G. FINCHER, and W. J. GIBBONS (*Cornell Vet., 19 (1929), No. 1, p. 55*).—The isolation of this organism from a foal at Elmira, N. Y., is described and the history of the case reported. This is thought to be the first record of its detection in a foal in the United States outside of Kentucky.

Kimberley horse disease (walk-about disease), D. MURNANE and A. J. EWART (*Aust. Council Sci. and Indus. Research Bul. 36 (1928), pp. 61, figs. 17*).—

An account of a disease of horses known to exist in northwestern Australia since the time of settlement, or for more than 40 years, and which is due to feeding upon *Atalaya hemiglauca*. A detailed description is given of the disease; an account of investigations conducted in 1926; botanical investigations in the Kimberley district; clinical and post-mortem observations in natural cases; inoculation experiments; feeding experiments; clinical observations, and post-mortem examinations on experimental cases; pathological findings; description and distribution of Atalaya; injection experiments with plant extracts; the poisonous constituents of *A. hemiglauca;* the dialysis and digestion of Atalaya saponin; the saponin content of Crotalaria species; relationship of Kimberley horse disease to certain obscure stock diseases; and methods of combating the disease. The effects of feeding Atalaya to guinea pigs and a further feeding experiment with leaves of *A. hemiglauca* are considered in appendixes.

A survival of the ova of Toxocara canis (Belascaris marginata) under field conditions, W. B. Owen (*Jour. Amer. Vet. Med. Assoc., 74 (1928), No. 1, pp. 58–62*).—It was found that between 74 and 80 per cent of the eggs of *T. canis* that were recovered survived the winter months in the soil in the region of Minneapolis. The eggs of *T. canis* can, under conditions of low temperature, remain dormant for 166 days and then, if the temperature is raised, again resume development.

Adenosarcomata of the kidneys of chickens, F. P. Mathews (*Jour. Amer. Vet. Med. Assoc., 74 (1929), No. 2, pp. 238–246, figs. 8*).—This is a report of a study made of 12 renal tumors in chickens at the Indiana Experiment Station. The tumors were found to belong in the class known as adenosarcoma, Wilm's tumor, mixed renal tumors, etc. The primary growth was located in the region of the left kidney in all cases. In one case metastatic tumors were found in the muscles of the left thigh, the left lung, and the right kidney.

Bacillary white diarrhea, W. L. Bleecker and S. J. Schilling (*Arkansas Sta. Bul. 231 (1928), pp. 46, 47*).—In work with this disease agglutination tests were made of 1,094 birds in which serum dilutions of 1 to 10, 20, 40, 80, and 160 were used. Twenty-five birds having agglutination titers of 1 to 10 or 20 were autopsied. of which only one failed to yield cultures of significance. It is concluded that fowl blood probably has no normal agglutination titer for *Salmonella pullorum*, and that in routine testing work any positive reaction should be regarded as indicative of some type of infection.

Comparisons were made of the frequency of the nonspecific precipitation known as the cloudy reaction in the agglutination test for carriers of *S. pullorum* when an unmodified antigen was used simultaneously with antigens containing 0.25 per cent sodium hydroxide, 0.1 per cent formalin, 5 per cent sodium chloride, and 1.8 per cent sodium chloride. The cloudy reaction was encountered in all antigens used and with such frequency that a satisfactory means of avoiding it was not indicated. The 0.25 per cent sodium hydroxide antigen reduced the total cloudy reactions and appeared to be of greatest value in altering the type of nonspecific precipitates, causing a diffused clouding to appear in place of flocculent clouding, which latter probably is the more serious type of interference. Thus, the sodium hydroxide antigen appeared as a definite improvement. In the tests the addition of formalin to antigen appeared of some value, but did not give as satisfactory results in suppressing the cloudy reaction as were obtained with the other modified antigens used.

Results of bacillary white diarrhea testing in Kansas for 1927–28, J. W. Lumb (*Jour. Amer. Vet. Med. Assoc., 74 (1928), No. 1, pp. 92–94*).—A brief report upon results obtained in 21 flocks tested in 5 counties widely scattered over the State of Kansas. A total of 15,141 birds were tested, of which 2,069 reacted and were removed, or an average percentage of infection in the flocks of 13.6 per cent.

Immunization against chicken pox infection by means of inoculation, C. H. Weaver (*Canada Expt. Farms, Poultry Div. Rpt. 1927, pp. 51–56, figs. 3*).—This is a report of work conducted in which the virus used for inoculation was prepared by taking natural infection scab material that had been dried and ground in normal saline solution and applying the same to the scarified combs of cockerels. The resulting scab material from this inoculation was placed in thin layers in open glass containers, gauze covered, and left exposed to permit complete drying of the product. The inoculating material was prepared by grinding the dried scabs in normal saline solution until a fine division of the scabs was obtained.

Fifteen pullets were inoculated by removing six to ten feathers from the outer aspect of the feathered portion of the leg of each individual and applying the virus fluid to the areas with a cotton swab, infection being obtained through the open feather follicles. These pullets were placed in a pen with 15 normal pullets on January 7. Four cockerels were inoculated on the blade of the comb with a pox virus, and on February 15 after lesions had sufficiently developed were introduced into the pen with the 30 pullets. Ten of the normal pullets developed pox, one of which succumbed. The results obtained indicate that fowls may be inoculated with chicken pox virus through the feather follicles, and that the cutaneous infection results in a high degree of immunity against a subsequent natural source of infection, but that there is a possibility of generalization following.

A brief report with a tabular list of the diseases met with at post-mortem examination of 1,752 birds is included.

The infectivity of isolated inclusion bodies of fowl-pox, C. E. Woodruff and E. W. Goodpasture (*Amer. Jour. Path., 5 (1929), No. 1, pp. 1–10, pls. 4*).—The authors find the inclusion bodies of fowl pox to be composed of hundreds of minute bodies inclosed in a fatty capsule. "The hyperplastic epithelium of the lesion of fowl pox, when subjected to tryptic digestion, liberates the intact inclusion bodies while the epithelial cells undergo complete digestion. A single inclusion body, when washed with saline and inoculated into the skin of the hen, has produced a typical fowl-pox lesion containing the characteristic inclusions. The fluid in which the inclusion body is finally suspended is innocuous. The inclusion bodies of fowl pox are interpreted as being true virus bodies, i. e., minute colonies of the etiological agent of the disease. The proliferation of the virus is accordingly largely, if not entirely, intracellular."

Studies of fowl paralysis (neurolymphomatosis gallinarum), I, II (*Jour. Expt. Med., 49 (1929), No. 1, pp. 62–102, pls. 7*).—The first contribution to this work, by A. M. Pappenheimer, L. C. Dunn, and V. Cone (pp. 62–86) based upon the studies previously noted (E. S. R., 57, p. 184; 58, p. 76), deals with the clinical features and pathology, and the second contribution, by Pappenheimer, Dunn, and S. M. Seidlin (pp. 87–102), with transmission experiments.

In transmission work the inoculation of suspensions of brain, cord, ganglia, or nerves of chickens with neurolymphomatous lesions into newly hatched chicks was followed by the development of typical lesions in approximately 25 per cent of the cases. In control chickens kept under laboratory conditions the incidence of the disease was about 7 per cent. The disease does not become manifest until at least 2 months after inoculation, and symptoms may not appear until after 4 months. The active agent is not destroyed by 50 per cent glycerol in 9 days at ice box temperature.

A note on the effect of anthelmintic treatment of hens on the hatchability of their eggs, A. S. Schlingman and M. J. Smead (*Jour. Amer. Vet. Med. Assoc., 74 (1928), No. 1, pp. 91, 92*).—The authors report upon experiments which show that the administration of tetrachlorethylene to hens as a vermifuge has no ill effect on the hatchability of the eggs.

Common diseases of turkeys, L. R. Vawter and E. Records (*Nev. Agr. Col. Ext. Bul. 61 (1928), pp. 71–103*).—This is a practical summary of information on the important diseases and parasites of the turkey.

The control of blackhead in turkeys by cecal abligation, A. J. Durant (*North Amer. Vet., 10 (1929), No. 2, pp. 52–55*).—In this further contribution from the Missouri Experiment Station on the subject (E. S. R., 58, p. 480), a summary is given of the results of two years' observations of cecal abligation for the prevention of blackhead. During this period 34 birds were operated upon and 42 used as controls. None of those on which cecal abligation was performed contracted blackhead when exposed to infected grounds for periods ranging from 2 months to 2 years, while 39 of the 42 controls running on the same ground for the same period contracted the disease. The data are considered to furnish ample proof of the efficacy of the operation as a preventive of the disease under natural conditions.

[Demonstration of the complete life cycle of the gizzard worm of ruffed grouse and bobwhite quail], E. B. Cram (*U. S. Dept. Agr., Off. Rec., 8 (1929), No. 4, p. 5*).—The author reports having demonstrated that the red-legged grasshopper may serve as an intermediate host of this gizzard worm (*Cheilospirura spinosa*). and that the final host, the bird, becomes infested with the parasite by consuming the grasshopper.

In the experiments conducted numerous larvae of the gizzard worm were recovered from the grasshopper 25 days after the nematode eggs had been fed to the insect. Parts of the grasshopper containing larvae were fed to quail, and adult male specimens of the gizzard worm were collected from the bird about 53 days later. That this parasite does not easily infest chickens is indicated by the fact that larvae from the grasshopper when fed to chickens failed to develop to adult gizzard worms.

Lung worm in foxes: Its cause and control, K. B. Hanson (*Fox Breeders Gaz., 5 (1928), No. 2, pp. 21–23*).—This is a practical account of *Capillaria aerophila.*

AGRICULTURAL ENGINEERING

[Agricultural engineering studies at the Arkansas Station], H. T. Barr, B. S. Clayton, and D. G. Carter (*Arkansas Sta. Bul. 231 (1928), pp. 8–10*).—Progress data are presented from investigations on plow draft, durability of posts, and farm building design.

The results of 500 plow-draft tests over a period of 2 years led to the conclusion that the draft per square inch of furrow section is inversely proportional to the depth of cut and to the width of plow bottom.

In the post experiments it was found that after 5 years galvanized steel posts showed no injury; black metal posts, painted, showed increased rusting and some pitting below ground. Pressure-treated pine posts showed no decay. Butt-treated, unseasoned oak posts apparently were not improved by treatment, as 62 per cent were unfit for use after 4 years. Cured native oak posts, given a 24-hour butt treatment in hot and cold bath creosote failed 3.1 per cent at 5 years, 16.8 per cent at 6 years, and 28.06 per cent at 7 years. At the end of 2 years small treated post specimens showed slight fungus growth and termite action, while untreated checks showed 7.7 per cent complete failure and approximately 83 per cent some decay or termite damage.

In a study of barns and barn plans it was found that a lengthwise unit distance of 40 in. in multiple or fractional parts met practically every animal and storage need for farm barns. The unit space adopted affords a highly flexible plan arrangement for individual needs.

A comparison of commercial house plans with Arkansas farm homes indicated that the commercial plan meets rural conditions so far as construction, finish, sanitation, and utilities are concerned, but that certain modifications are necessary. The principal modifications appear to be more emphasis on the one story house, larger kitchens, fewer and larger rooms, smaller total area, more work-porch area, and direct entrance to the kitchen from the outside.

Surface water supply of Missouri River basin, 1924 (*U. S. Geol. Survey, Water-Supply Paper 586* (*1928*), *pp. VIII+343, fig. 1*).—This report, prepared in cooperation with the States of Montana, Wyoming, Iowa, Colorado, Missouri, and Kansas, presents the results of measurements of flow made on streams in the Missouri River basin during the year ended September 30, 1924.

Geology of reservoir and dam sites with a report on the Owyhee irrigation project, Oregon, K. BRYAN (*U. S. Geol. Survey, Water-Supply Paper 597–A* (*1929*), *pp. IV+72, pls. 10, figs. 5*).—Part 1 of this paper is a treatise on the geology of reservoir and dam sites, with special reference to the principles and methodology of study involved. Part 2 deals specifically with the geology of the Owyhee irrigation project in Oregon.

[Irrigation experiments at the Irrigation Substation], C. C. WRIGHT (*Washington Col. Sta. Bul. 229* (*1928*), *pp. 57–61*).—Progress data are briefly reported from experiments on water measurement, frequency of irrigation, soil moisture, and alkali reclamation. The data bring out the fact that there is no special advantage in applying water to alfalfa more often than every 30 days when the application is as much as 7 acre-in. per acre, but that six weeks between irrigations ordinarily results in reduced yields, even though the irrigations are comparatively heavy.

Experiments with corn indicated that the yields are not greatly influenced by different irrigation treatments so long as the soil moisture content is kept reasonably above the wilting point and below the saturation point.

Drainage in the Sacramento Valley rice fields, W. W. WEIR (*California Sta. Bul. 464* (*1929*), *pp. 37, figs. 12*).—This is a general summary of several years of experience in the drainage of rice lands in the Sacramento Valley. The conclusion is that drainage of these lands has three functions, viz, (1) to put the land into such condition that it can be prepared for planting in the proper way by the most improved methods, and at the proper time; (2) that the crop may be grown and matured with the least possible damage to other crops or land on nearby or adjacent fields; and (3) that the rice fields may be unwatered and dried out so that the crop may be harvested with the least delay when it is mature.

Tillage and soil moisture problems [at the Adams Substation], H. M. WANSER and I. M. INGHAM (*Washington Col. Sta. Bul. 229* (*1928*), *pp. 46, 47*).—Data are briefly reported indicating that the draft of tillage machines varied as the amount of work performed on the soil by the tillage implement. When the width of strip cultivated per unit of power was increased by changing the type of implement less work was performed on the soil and consequently an inferior degree of tilth was obtained, although no exact measurement of tilth was perfected.

Reclamation of peat land in northern Europe, W. G. OGG (*Scot. Jour. Agr., 12* (*1929*), *No. 1, pp. 5–20, pls. 2*).—A brief description of some of the peat lands in northern Europe is given, and examples of reclamation are cited in northwest

Prussia, Bavaria, and Denmark. The reclamation and development work includes drainage and cultivation by special machinery.

In the latter connection a new cultivation machine has been devised in Germany for the first cultivation of peat soils. It is a motor-driven machine like a tractor with wide wheels, and an attachment behind containing a long shaft with knives or tines. When this is put into gear it revolves at a rapid rate and is then lowered to the surface of the peat, which is churned into small pieces. It is usual to cultivate twice with this machine, first to a depth of 8 in. and the second time to a depth of about 15 in. The surface of the peat is thoroughly broken up and aerated at a much less cost than by any other means, and one machine can cultivate from 8 to 12 acres (single cultivation) per day.

The regular use of these machines for subsequent tillage is not advisable, since they are apt to allow the land to become infested with weeds and they produce too fine a tilth, making the surface impermeable to rain water.

Report of a plan of highway improvement in the regional area of Cleveland, Ohio (*U. S. Dept. Agr., Bur. Pub. Roads, 1928, pp. 187, pls. 9, figs. 103*).—This elaboration of the paper previously noted (E. S. R., 60, p. 278) deals with an investigation undertaken as a basis for planning to serve present and expected future traffic during a period of 10 years. The first part of the report contains a summary of the principal conclusions, the second the detailed data of the survey upon which the findings are based, and the third the plan of highway improvement.

Load test of large model of cellular concrete arch, R. J. Fogg (*Engin. News-Rec., 102 (1929), No. 11, pp. 418, 419, figs. 2*).—Tests conducted at Lehigh University of a box-section hollow rib under two-point loading between rigid abutments are reported.

The results showed that the arch ring carried nearly 60 times its own weight under very unfavorable loading. The failure was caused by a heavy concentration on the thin model, coupled with heavy radial shears produced just outside of the loading points. These heavy local stresses and excessive radial shears would not occur on a full-size arch, especially where loading is applied at intervals along the arch instead of at two points only.

The computed compressive stresses were in all cases higher than those indicated by the extensometer measurements. Under 180,000 lbs. the compression ranged from 1,000 to 1,700 lbs. per square inch near the crown and from 1,100 to 1,900 lbs. per square inch in the haunches. The maximum web stress due to shear, just before the first sign of crack at the 180,000-lb. loading, was estimated to be about 500 lbs. per square inch. The deflection at the crown under the same loading was ¼ in.

Reinforced brickwork, M. Vaugh (*Missouri Univ., Engin. Expt. Sta. Bul. 28 (1928), pp. 84, figs. 68*).—The results of a series of experiments are reported and discussed, indicating that slabs and beams of reinforced brickwork are technically practicable under American building conditions. Such slabs and beams react in a manner practically identical with the reactions of reinforced concrete, due allowance being made for properly proportioned stresses in concrete and steel.

The modulus of elasticity of brickwork made with cement-sand mortar and brick is assumed as 2,000,000 lbs. per square inch for ordinary calculations. Under the conditions of the experiment, stresses of 650 lbs. per square inch in compression on the brickwork are considered safe and probably unnecessarily conservative.

It was found that shearing stresses in beams are not so well resisted by brickwork as by concrete, and that while small beams may be made safe without stirrups, no important beam should be made without at least light stirrups. Stirrups in general should be heavier than called for by standard concrete practice, and it seems very important that some top reinforcing be supplied near the ends of beams by placing small rods in the top mortar joint or by bending up one or more rods. Slabs made of not more than one course of brick seem to have no difficulty in resisting the shear likely to come on them if the slab is otherwise properly designed.

Careful and accurate control of the moisture content of the brick was found to be very important. Brick with too high absorptive powers will injure the mortar by removing too much water. Brick completely saturated or glazed to prevent absorption are hard to lay, do not develop the full adhesion of the mortar, and do not take full advantage of the water-cement ratio law.

Low temperature coal-tar creosote in wood preservation [trans. title], V. Hruban (*Sborn. Výzkumn. Úst. Zeměděl. Repub. Československ.* (*Rec. Trav. Insts. Recherches Agron. Répub. Tchécoslov.*), *No. 30* (*1927*), *pp. 73+*[*1*], *figs. 21; Eng. abs., pp. 70–73*).—Studies are reported which showed that on an artificial medium the toxicity of low temperature coal-tar creosote is about half that of high temperature creosote and double that of mercuric chloride. On the other hand, when impregnated into wood the toxicity against the attack of *Coniophora cerebella* of both kinds of creosote was found to be smaller than that of mercuric chloride.

The results indicated that low temperature creosote on the whole fulfills the requirements of permanency comparatively well, it being slightly superior as to constancy of weight and slightly inferior as to constancy of toxicity as compared with the high temperature creosote. No injuring of wood was ascertained in any case. Parts of the low temperature creosote were found to be leached out to a greater extent than those of the high temperature creosote, but the leaching out does not attain an extraordinary degree. The low temperature creosote was found to be superior as to waterproofing quality since it decreases the rate of absorption of water by wood. However, neither of the two kinds of creosote protected wood against the absorption of water to such an extent as to prevent the growth of fungi in wood in contact with a constantly wet medium. No difference was found in the penetration of the two types of creosote into wood.

The results showed that the low temperature creosote fulfills the requirements of a preservative. It can, therefore, be expected that wood treated with low temperature creosote will attain an average life between that of wood similarly treated with high temperature creosote and the average life of kyanized wood.

Mixtures of sodium fluoride with some of the organic dinitro compounds in wood preservation [trans. title], V. Hruban and V. Stibor (*Sborn. Výzkumn. Úst. Zeměděl. Repub. Československ.* (*Rec. Trav. Insts. Recherches Agron. Répub. Tchécoslov.*), *No. 28* (*1927*), *pp. 83+*[*1*], *figs. 9; Eng. abs., pp. 82, 83*).—The results of laboratory tests of four mixtures of sodium fluoride with organic dinitro compounds for wood preservation are reported. These mixtures were found to be suitable for impregnation by the pneumatic method. It is thought that wood treated with 1.8 per cent solutions would very likely attain at least the durability of wood treated with corrosive sublimate according to the Kyan method.

Tests on lubricating oils, M. V. Dover (*Missouri Univ., Engin. Expt. Sta. Bul. 27* (*1928*), *pp. 52, figs. 18*).—Tests to throw light on the effect of a prolonged treatment with ozone on the lubricating value and other properties of eight different samples of mineral oils and of samples of olive oil are reported.

The results showed that all of the lubricants are affected by prolonged treatment with ozone, and that there is no definite relation between any of the chemical and physical properties and the so-called oiliness of the lubricants. In general the readings of the Deeley machine are more regular after the lubricant has been treated with ozone than before treatment. There are indications that the lubricants are inclined to corrode metals in contact with them for a rather long period of time after prolonged treatment with ozone.

Researches on springs.—II, The measurement of the displacements of vehicle springs under road running conditions, J. H. Hyde (*[Gt. Brit.] Dept. Sci. and Indus. Research, Engin. Research, Spec. Rpt. 8 (1928), pp. VI+42, pl. 1, figs. 34*).—A description of experimental apparatus used in spring testing is given, together with a report of the results of tests with different vehicles. No conclusions are drawn.

Some new developments in combine harvesting in Idaho, H. Beresford and E. N. Humphrey (*Agr. Engin., 10 (1929), No. 2, pp. 45–47, figs. 4*).—In a contribution from the Idaho Experiment Station some new developments in combine harvesting are briefly described and illustrated. These include such features as combining peas, the horse and tractor combination hitch, carrying the front end of the combine on the tractor, and bulk handling of grain.

The combine in the prairie provinces, E. A. Hardy (*Agr. Engin., 10 (1929), No. 2, pp. 55, 56, figs. 3*).—In a contribution from the University of Saskatchewan a brief statement is made descriptive of combining practice in the prairie provinces of Canada.

The combine in Saskatchewan, J. K. MacKenzie (*Agr. Engin., 10 (1929), No. 2, pp. 57, 58, figs. 4*).—In a contribution from the Dominion Experiment Station at Swift Current, a brief description of combining practice in Saskatchewan is given. It is pointed out that the introduction of the swather or windrowing device and the pick-up were the outstanding developments in combining practice during 1928.

Windrow method of combine harvesting, A. J. Schwantes (*Agr. Engin., 10 (1929), No. 2, pp. 49, 50, figs. 4*).—Experiments conducted at the Minnesota Experiment Station are briefly reported which indicate that the windrower is almost indispensable when combining a weedy field. Its use may lengthen the harvest season by several days, and the windrow, if properly made, will remain on the stubble for a long time. On the other hand, the indications are that straight combining may be made quite successful under normal weather conditions in the absence of weeds or in conjunction with some means of separating green weed seeds and parts of weed plants from the grain in the process of combining.

Harvesting beans with the combine in Michigan, E. C. Sauve (*Agr. Engin., 10 (1929), No. 2, pp. 51, 52, figs. 3*).—Experiments conducted at the Michigan Experiment Station are reported which showed that a fair job of separation of beans can be attained with the regular combine equipment with minor changes and adjustments. It is quite evident, however, that there should be a wider spacing between the cylinder teeth and the concave teeth. Where large acreages of beans are handled it appears advisable to substitute the special bean cylinder and concaves for the regular small grain equipment.

Grain loss tests of combine harvesters in Missouri, M. M. Jones (*Agr. Engin., 10 (1929), No. 2, pp. 47, 48, figs. 2*).—Tests conducted at the Missouri Experiment Station are reported which showed that the combine thresher losses in most cases were not excessive and amounted to less than the cutter bar losses, but were slightly higher than for the binder-thresher method. The windrowing system appears to reduce the trouble due to high moisture content and to lower threshing losses in weedy grain. It also appears to increase the rate of harvesting under adverse conditions.

Cleaning grain harvested with the combine, R. H. Black (*Agr. Engin.*, *10* (*1929*), *No. 2*, *pp. 53, 54*, *figs. 2*).—In a contribution from the U. S. D. A. Bureau of Agricultural Economics, experiments are briefly reported which showed that part of the weed seeds in grain can be removed with present types of grain cleaners available for combines if the windrow method of harvesting is used. Straight combined grain may be cleaned with present available equipment within a few hours after the grain is cut. Attention is drawn to the need for further research to devise means for removing more of the high moisture weed seed at the combine.

Effect of weather conditions on the moisture content of standing grain, C. O. Cromer, J. S. Cobb, and H. B. Josephson (*Agr. Engin.*, *10* (*1929*), *No. 2*, *p. 54*, *figs. 4*).—Investigations conducted at the Pennsylvania Experiment Station are briefly reported which showed that there was a steady decrease in the moisture content of wheat and oats from 9 o'clock in the morning until 6 or even 7 o'clock in the evening, even though the relative humidity began to increase after about 2 p. m. During different days the grain lost from 3 to 8 per cent in moisture content, depending upon weather conditions, which was partially or wholly taken up the following night depending upon atmospheric conditions.

The daily loss in moisture content varied inversely with the average daily relative humidity. The moisture content of the wheat increased from 3 to 5 per cent overnight from heavy dews, and 0.5 in. of rain at night increased it 8.3 per cent. No definite hour in the morning for starting the combine is indicated by these findings since it appears to depend entirely upon weather conditions.

Some preliminary results of grain drying studies, W. M. Hurst (*Agr. Engin.*, *10* (*1929*), *No. 2*, *pp. 61, 62*, *fig. 1*).—In a brief contribution from the U. S. D. A. Bureau of Public Roads an account is given of experiments conducted on the drying of grain, special attention being drawn to the methods and equipment.

The data secured showed that wheat was reduced from 18 to 14 per cent in moisture content in from approximately 40 to 80 minutes, depending largely upon the rate at which heat was supplied. The number of British thermal units supplied by the heater in drying the grain varied from about 14,320 to 10,240 per bushel. The results also seemed to show that the quantity of air forced through the grain is significant only in so far as it affects the number of British thermal units supplied. The results indicated that the heat requirements for drying wheat under the test conditions are equivalent to about 1 lb. of coal per bushel of wheat at 100 per cent efficiency for the heating unit.

Germination tests showed slight variations throughout each test, regardless of the temperature to which the grain was subjected. The rate at which the grain was dried had no effect on the maximum test weight, and the test weights of samples of grain dried under atmospheric conditions varied only slightly from those dried quickly under artificial conditions.

Progress in grain drying in New York, H. W. Riley (*Agr. Engin.*, *10* (*1929*), *No. 2*, *p. 60*, *fig. 1*).—In a brief contribution from the New York Cornell Experiment Station the apparatus used in experiments on the drying of grain is described and illustrated.

Studies of moisture content and drying of combined grain in Virginia, D. C. Heitshu (*Agr. Engin.*, *10* (*1929*), *No. 2*, *pp. 63, 64*, *fig. 1*).—Experiments conducted at the Virginia Experiment Station are briefly reported, the most outstanding result of which was the close relation found between the moisture content of wheat and the relative humidity. It appeared that rainfall does not affect the moisture content of standing wheat except as it causes a change in the relative humidity.

The results further showed that the windrow method of harvesting should allow a longer harvesting day, since the windrow is drier in the morning than the standing grain. The daily variation of the moisture content of windrowed wheat is less than that of standing grain, which means drier wheat in the windrow in the morning. The indications are that standing grain absorbs less moisture from rain than windrowed grain, but the windrow seems to dry more rapidly.

Experiments on grain drying by natural ventilation indicated that simple naturally ventilated bins hold considerable promise for the eastern farmer using the combine.

Threshing with electric power, H. L. Garver (*Elect. West, 62 (1929), No. 3, pp. 142, 143, figs. 2*).—The results of threshing tests with electricity are briefly reported which indicated that a 10-h. p. motor will furnish sufficient power to operate a small threshing machine. The average power requirement was approximately 8.5 kw. when threshing a bushel of barley per minute.

"In the light of the tests so far conducted it would appear that eventually there may be a field for the application of electric power for threshing, particularly on smaller farms where threshing is done from stacks near the farm building."

A hydro-electric farm installation, M. E. Haldane (*Scot. Jour. Agr., 12 (1929), No. 1, pp. 21–26, pls. 2*).—A small hydroelectric scheme in Scotland is described which has been employed for both domestic and agricultural purposes for a period of three years.

Application of engineering to dairy production, H. B. Walker (*Agr. Engin., 10 (1929), No. 2, pp. 71, 72, fig. 1*).—In a contribution from the California Experiment Station a review is given of the need and importance of engineering applications to dairy production.

Poultry farm equipment, H. H. Alp (*Illinois Sta. Circ. 333 (1929), pp. 20, figs. 33*).—Practical information on poultry-farm equipment is given.

Investigation of warm-air furnaces and heating systems, III, A. C. Willard, A. P. Kratz, and V. S. Day (*Ill. Univ., Engin. Expt. Sta. Bul. 188 (1929), pp. 82, figs. 53*).—This is the fifth of a series of reports of the results of warm-air furnace research (E. S. R., 55, p. 296). A large amount of data is presented and discussed relating to the crab-radiator type of furnace, the open-dome type of furnace, and with different furnace arrangements.

Experiments on the effect of length of leader on the heat delivered at the register showed that the resistance of the leader pipe is of less importance in the determination of heating effect obtainable than is the resistance of the stack where the stack area is less than the leader area. The pitch of the leader pipe is not an important factor in the heating effect of a piping system having fixed heights between furnace and registers. It is more important to limit the length of leader pipe to first floors than to second floors. In designing systems on the basis of register air temperature, a uniform temperature should not be assumed to exist at the registers if much variation in the length of leader pipe exists. Instead, the individual pipe sizes should be based on their respective and correct register air temperatures.

Experiments on warm-air leader-pipe coverings and surfaces showed slightly superior performance by air-cell insulation over the entire test range. However, the results were such as to place a doubtful value on the insulation of bright tin warm-air leader pipes, except where these pipes are exposed to the chilling effects of leaky basement windows, are extremely long, or pass through cold walls.

Experiments on the effect of elbows in leader pipes showed that an elbow in a pipe to a second-story register causes a reduction in heating effect of 4.9 per cent, as compared with the same pipe without an elbow. The effect of one elbow in a first-story pipe causes a reduction in heating effect of 3.3 per cent.

A comparison of floor and wall types of registers showed that in the case of second-story floor register combinations in which an elbow at the top of the stack is necessary, the heating effect for a floor register combination is decidedly lower than for a wall register combination on the same stack. The choice between floor and wall types of register combinations should favor that system which offers the least resistance due to elbows or angles. In the case of register combinations on first-story pipes, the results indicated that for a given register air temperature the baseboard register combination has slightly less heating capacity than the floor register combination, although the particular arrangements of fittings used may have a marked effect on performance.

Handbook of domestic oil heating, edited by H. F. Tapp (*New York: Amer. Oil Burner Assoc., 1928, pp. 383, figs. 153*).—This handbook gives information concerning the problems of combustion and heating that is necessary in the use of oil heating equipment. It contains the following chapters: Definitions and terms, heat transfer and heating requirements, oil as fuel, characteristics and properties of fuel oil, comparative fuel costs, fuel oil combustion, oil burners and controls, oil fuel storage, oil pumps and piping, boilers and furnaces, hot water and steam heating systems, warm air heating, inspection and survey of heating plant, installations and tests, sales and service, ordinances and oil heating, oil heating and the architect, and miscellaneous tables and information.

Farm home planning, M. Johnson (*Arkansas Sta. Bul. 231 (1928), p. 50*).—The average farm home visited was a one-story frame structure, with 2 porches, approximately 6 rooms, and an average of 1,169.74 sq. ft. of floor space. The majority of these homes were deficient in natural lighting, the ratio of window area to floor space being 1:8.34 to 11.47. Bedroom space was also deemed insufficient, and only 3.24 per cent of the houses were plastered. Less than 20 per cent had running water with plumbing fixtures, electricity, or laundry equipment. Farms of 120 acres or more had notably more conveniences than those with smaller acreages.

RURAL ECONOMICS AND SOCIOLOGY

[Papers presented at the nineteenth annual meeting of the American Farm Economic Association] (*Jour. Farm Econ., 11 (1929), No. 1, pp. 1–167, 184–191, figs. 9*).—Included are the following papers and discussions thereon presented at the meeting at Chicago, Ill., in December, 1928: The Farmer's Interest in the Great Lakes-St. Lawrence Waterway Project, by E. G. Nourse (pp. 1–23); Who Gets the Benefit of Improvement in Agriculture? by H. E. Erdman (pp. 24–45); The Bureau of Agricultural Economics Estimates of Agricultural Income in the United States, by H. R. Tolley (pp. 46–63); The Gasoline Engine and the Farmer's Income, by W. I. King (pp. 64–78); Continuous Economic Information Readily Available to Farmers, by C. Williams (pp. 79–94); Research Problems Involved in Providing Continuous Economic Information to Farmers, by J. W. Tapp (pp. 95–107); Encouraging the Farmer to Take Agricultural Outlook Material and Use It, by V. B. Hart (pp. 108–127); Progress in Price Analysis and an Appraisal of Success in Price Forecasting, by O. C. Stine (pp. 128–140); Outlook for the Apple Industry, by M. R. Cooper (pp.

141–151); and Seasonal Adjustments of Production and Consumption in Fluid Milk Areas, by F. F. Lininger (pp. 152–167). The proceedings of the meeting and the reports of the officers and committees are also given.

Agricultural economics, J. E. Boyle (*Philadelphia and London: J. B. Lippincott Co., 1928, 3. ed., rev., pp. IX+519, figs. 96*).—A revised edition of the text previously noted (E. S. R., 45, p. 691).

Economics of consumption, W. C. Waite (*New York and London: McGraw-Hill Book Co., 1928, pp. XII+263, figs. 14*).—This book is intended especially for the use of household and market economists and for a course for home economic students having some acquaintance with the principles of economics. Following a chapter on the nature of the consumption problem, the material is arranged in chapters grouped under the headings of the system of prices and the consumer, the choice of goods, administration of the individual income, and social problems of consumption.

Research as a basis for an agricultural policy and program, H. E. Erdman (*Jour. Farm Econ., 10 (1928), No. 4, pp. 525–533*).—This paper, presented at the meeting of the Western Society of Farm Economics at Berkeley, Calif., July 7, 1928, outlines the fields that should be considered by a division of agricultural economics in a State agricultural experiment station.

Development, methods, and results of agricultural economic research in the United States, S. von Frauendorfer, trans. by A. M. Hannay (*Ber. Landw. Reichsmin. Ernähr. u. Landw.* [*Germany*], *n. ser., 8 (1928), No. 1–2, pp. 70–88; trans. in Jour. Farm Econ., 10 (1928), No. 3, pp. 286–311*).—A description and discussion of the development and results of research in agricultural economics and rural sociology in the United States.

Agricultural economics, C. S. Orwin (In *Agricultural Research in 1927. London: Roy. Agr. Soc. England, 1928, pp. 56–76*).—Short summaries are given of the research work during the year on costs of production and financial results of farming, marketing, cooperation, farming policy, cost accounting, rents and prices of agricultural land, and efficiency of labor.

Trends in the agriculture of the hard winter wheat belt, W. E. Grimes (*Jour. Land and Pub. Util. Econ., 4 (1928), No. 4, pp. 347–354*).—A companion article to that by Lattimer previously noted (E. S. R., 60, p. 384). The changes that have taken place since the war in land values, cropped acreages, acreage in wheat, production methods, and use of home conveniences in the parts of Nebraska, Kansas, Oklahoma, Colorado, and Texas forming the hard winter wheat belt are discussed.

Types of farming in Iowa, C. L. Holmes (*Iowa Sta. Bul. 256 (1929), pp. 113–166, figs. 16*).—This bulletin presents the results of a study to determine the general character of the farming in different parts of Iowa and the forces and conditions that have created the various types. It is based chiefly on information collected by the U. S. Bureau of the Census and the State Department of Agriculture.

Maps are included showing by townships the percentages of farm land in corn, oats, wheat, hay, and pasture in 1925; the number, January 1, 1925, of hogs and beef cattle per 100 acres, of dairy cattle and horses and mules per 1,000 acres, and of poultry per 10 acres of farm land; and the acreage of woodland and waste land. Other tables show the normal annual precipitation, average length of growing season, types of soil, type-of-farming areas, and the gross income of farmers, 1924, by chief sources and for the type-of-farming areas.

The factors determining the types of farming and the problems of readjustments in the several areas are discussed.

Systems of farming for the hill sections of Mississippi, L. E. Long and R. S. Kifer (*Mississippi Sta. Bul. 257* (*1928*), *pp. 50, figs. 16*).—This bulletin reports the results of a study made in Choctaw County in cooperation with the Bureau of Agricultural Economics, U. S. D. A., preliminary reports of which have been previously noted (E. S. R., 55, p. 181; 56, p. 784; and 59, p. 87). It is based upon survey records obtained from 15 farms in 1920, 12 in 1921, 16 in 1922, and 21 in 1923, and detailed cost records from 24 farmers in 1924, 19 in 1925, and 19 in 1926, the records from 17 farms covering the entire 3-year period.

The physical characteristics of the section and the effect on crop and livestock adaptation are discussed briefly. An analysis of the data obtained is made showing the material and labor requirements for the production of different crops, work stock, milch cows, hogs, sheep, and poultry, and the expected prices of marketable products.

Suggested systems of farming are outlined for farms with 40, 70, and 120 acres of cropped land, showing the crop and feed requirements and the estimated production, expenses, and returns. Information and forms are given to assist farmers in planning their individual farms.

Progress report on cost of production route in Jones County, Mississippi, 1927, L. E. Long and J. R. Allen (*Mississippi Sta. Bul. 256* (*1928*), *pp. 35*).—The data for the first year's records from 19 farms are tabulated and discussed. Tables are included showing for each farm the investment, receipts, changes in inventory, value of products, value of items furnished the home, value of family labor, expenses, farm income, value of operator's labor, and return on investment; costs by items per acre, per pound, and per bushel or other units of production in producing cotton, corn, hay, sweet potatoes, sugar cane for sirup, and garden and truck crops; number of hours of man labor and horse and tractor work required for different operations, and amounts of seed, fertilizers, etc., required per acre for the different crops; and cost by items and feed requirements in maintaining work stock and milch cows and in producing poultry and pork.

This study was made in cooperation with the U. S. D. A. Bureau of Agricultural Economics.

Farm cost studies in the United States, M. K. Bennett (*Food Research Inst.* [*Stanford Univ.*] *Misc. Pub. 4* (*1928*), *pp. XV+289, figs. 12*).—This study describes and evaluates the past and present work in the United States in collecting and analyzing statistics of farm costs of production. Its main purpose is to point out the misinterpretations that have been made of the existing doctrines of price theory.

The sources and types of farm cost statistics and the development of and objectives in farm cost investigations are described; the methods of collecting cost data, the significance of accounting principles, and the nature of variations in farm costs are discussed; and the cost studies undertaken for the furtherance of farm management and those undertaken to influence prices are analyzed and discussed, special attention in the latter case being given to the relation of agricultural costs to agricultural prices and to the theories underlying the use of farm cost data in price fixing and in tariff making. Account keeping for farmers and the development of principles of accounting are not discussed, and the measurement and causes of farm prosperity only briefly.

The author concludes that "statistics of money costs per unit of product are of negligible value in a program intended to increase farm efficiency; they contribute next to nothing to the theory of cost-and-price relationships in agriculture; and they do not provide a sound basis for price fixing or for tariff making.

Such data as are of value for farm management purposes are not statistics of money costs per unit of product."

It is believed, however, that farm efficiency can be increased through work with farm accounts. The nucleus of a program for such work would be the teaching of simple accounts to farmers and the establishment of cooperative farm management services in which the farmers bear the greater part of the expense for supervisors.

Farm prices and the value of gold, I, II, J. R. Commons (*North Amer. Rev., 225 (1928), Nos. 1, pp. 27–41, figs. 2; 2, pp. 196–211*).—Part 1 compares the stabilization of values of manufactured goods and nonagricultural raw materials with the fluctuations of values of agricultural products, especially cotton and wheat. These are connected with the changes in the value of gold expressed in the "index number" of prices, and with the operation of the Federal reserve system in regulating the value of gold.

Part 2 discusses the effects of changes in the tariff, the loans to European countries for war and productive purposes, and the payments of interest and principal of such loans upon the gold supplies, and the changes in the rediscount rates and prices in the United States and foreign countries.

While tariff reduction, war debt cancellation, cooperative marketing, farm relief, and other methods would better farm prices, the author believes they would be inadequate, as their results can be nullified unless the Federal reserve system stabilizes the value of gold through the use of its power to control both the price and volume of credit.

Farm leases, compiled by R. L. Adams (*[Berkeley, Calif., 1928], pp. [130]*).—This is a mimeographed collection of forms of leases covering field crops (irrigated and dry farmed), delta lands, alfalfa, rice, potatoes, orchards, dairies, truck, and pasturage. Forms of renewal and assignment of leases and special provisions in leases, together with an index to selected paragraphs in the forms given, are also included.

The pre-ownership steps on the "agricultural ladder" in a low tenancy region, C. F. Wehrwein (*Jour. Land and Pub. Util. Econ., 4 (1928), No. 4, pp. 417–425, figs. 2*).—The study reported on was based upon data from 201 of the 267 farm occupiers in Newton Township, Manitowoc County, Wis., a dairying township with a percentage of farm tenancy of only 4.14, with 66.6 per cent of the farmers born in the township, and 68.85 per cent of present owners related to the immediately previous owners. Of the 201 occupiers, 48.3 per cent obtained their farms by inheritance and 51.7 per cent by working for wages, 27 and 16 per cent, respectively, having worked at other rural occupations than farming and in urban occupations.

The problem of agricultural credit in Rumania, D. Juvara (*Le Problème du Crédit Agricole en Roumanie. Paris: Edouard Duchemin, 1928, pp. 283*).—The agricultural situation, the need for agricultural credit, the institutions and other agencies for furnishing such credit for different purposes and to different types of operators, the legislation regarding such credit since the war, and the proposals for bettering agricultural credit facilities are described and discussed.

The assessment and equalization of real property in Delaware, M. M. Daugherty (*Delaware Sta. Bul. 159 (1928), pp. 51, figs. 8*).—This bulletin presents the results of a study based chiefly on the records of assessed valuation and sale price of the county boards of assessment of Delaware. Tables are given showing for the years 1921, 1924, 1926, and 1927 the ratio of assessed valuation to sale price grouped by sale values of $1,000 from zero to $12,999, $13,000 to $15,000, $15,000 to $25,000, and $25,000 and over, and the weighted average for property in Wilmington and for town, farm, and all property in each of the three counties of the State.

Other tables show for the different kinds of property in each county the rate of decrease of the ratio of assessment per $1,000 increase of sale value, 1921, 1924, 1926, and 1927; the changes of distribution of size of farms, 1910, 1920, and 1925; the inequality of assessments as shown by coefficients of dispersion, the progress in equalization of assessments, the amount of taxes overlevied and underlevied, and the amount of school taxes wrongfully levied, 1921, 1924, 1926, and 1927; and by counties for the four years the amounts of county taxes wrongfully levied on properties overassessed, and the percentages wrongfully levied due to differences in ratios of assessment.

Graphs are included showing for each county for each year the ratio of assessment to sale value for different kinds of property, and for 1927 the relation between sale value and ratio of assessment of properties of different values.

The average ratios of assessment to sale price for the four years varied from 64.9 to 77.6 per cent for Wilmington property, and from 69.3 to 73.5 per cent for town and 75.5 to 83.6 per cent for farm property in New Castle County; from 73.7 to 88.1 per cent for town and 80.4 to 92.5 per cent for farm property in Kent County; and from 74.3 to 79.7 per cent for town and 82.6 to 103.6 per cent for farm property in Sussex County. Except for farm property in New Castle County and for Wilmington property, the ratios of assessment in 1927 showed a marked tendency to decrease as the sale value increased.

The coefficients of dispersion for the several years show that within the individual groups from 1921 to 1927, Wilmington property, Kent County town and farm properties, and Sussex County farm property became more equally assessed, and New Castle County town and farm properties and Sussex County town property became less equally assessed. Wilmington property and town property in New Castle County were found to be escaping much of their share of the State school tax, due to their low assessment ratios.

More frequent reassessments, better facilities to enable boards of assessment to make scientific assessments, and publicity of the ratios of assessment to sales price are suggested as methods of remedying the present unequal assessments.

Appendixes illustrate the methods used in calculating the relation between activity of the market and the ratio of assessment to sale price, linear trend of the relation between selling price and the ratio of assessment, the average deviation and coefficient of dispersion, and the amounts mislevied by unequal assessments and the probable error of the average assessments.

State systems of taxation for public schools.—I, The Wisconsin plan, F. H. SWIFT (*Amer. School Bd. Jour., 78 (1929), No. 3, pp. 61, 62, 142*).—This is the first of a series of articles describing the systems used by different States in raising money for public school purposes.

In 1926, 94.8 per cent of the State-furnished moneys for school purposes in Wisconsin was obtained by State taxes. More than 77.3 per cent was transferred from the proceeds of income taxes, and part of the remaining 17.5 per cent was also paid from the same source.

The apportionment of State school funds.—V, The Massachusetts plan, F. H. SWIFT (*Amer. School Bd. Jour., 78 (1929), No. 2, pp. 43–45*).—This is the fifth article of the series previously noted (E. S. R., 59, p. 889). The principles of the Massachusetts plan are set forth as follows: (1) State aid should be given as a reimbursement for moneys previously expended, (2) a certain portion of State aid should be distributed to all communities regardless of their wealth, (3) an important function of State aid is the stimulation of local effort, and (4) the responsibility rests with the State of equalizing the school burdens, revenues, and educational opportunities.

Tariff problems of the United States, edited by H. T. COLLINGS (*Ann. Amer. Acad. Polit. and Social Sci., 141 (1929), No. 230, pp. X+290, pl. 1*).—The part on agriculture and the tariff is composed of papers on Farm Relief and the Tariff, by A. Capper (pp. 120-123); The Home Market for American Agriculture, by J. D. Black (pp. 124-136); Is the Agricultural Tariff Protective? by J. M. Gersting (pp. 137-148); Some Aspects of Tariff Remissions on Sugar, 1876-1927, by R. H. Anderson (pp. 149-159); and Observations on Foreign Markets for Agricultural Commodities, by T. J. Hammatt (pp. 160-174).

Other papers are included in the parts on reexamining American tariff problems, making the tariff, foreign investments and the tariff, and international complications of the tariff. A brief bibliography on tariff and international trade is given (pp. 265-270).

British food control, W. H. BEVERIDGE (*London: Humphrey Milford, Oxford Univ. Press; New Haven: Yale Univ. Press, 1928, pp. XX+447, pl. 1, figs. 4*).—This volume is one of the British series on the Economic and Social History of the World War of the Carnegie Endowment for International Peace. It reviews the British food control from August 4, 1914, to the end of the Ministry of Food, March 31, 1921.

When shall we sell our corn? G. S. SHEPHERD (*Iowa Sta. Circ. 113 (1929), pp. 23, figs. 9*).—This circular discusses the cost of storing corn due to shrinkage, interest, insurance, and losses from vermin, rats, and mice; the increase of price due to rise in grade and seasonal rise in price; and the effect of large and small crops on seasonal rise in price. It was found that in 21 out of the last 23 years, storage was advantageous after a crop that was over 95 per cent of the average crop.

A survey of milk marketing, F. J. PREWETT (*Oxford: Clarendon Press, 1928, pp. 74, pl. 1, figs. 23*).—This survey is based on the conditions in Wiltshire and Somerset and the city of Bristol, England, in June, 1927. The report covers the movement of milk from the farm; details of marketing organization; the distributive service of Bristol and Glastonbury; factory and depot organization; cooperation; costs, margins, and prices; and the utilization of milk.

The cooperative marketing of tobacco, O. B. JESNESS (*Kentucky Sta. Bul. 288 (1928), pp. 271-306*).—A general decription of the plan of organization, progress, and problems of and the results obtained by the Burley Association, together with briefer descriptions of other cooperative tobacco associations.

Cooperative marketing of livestock in North Dakota, A. H. BENTON and H. E. SEIELSTAD (*North Dakota Sta. Bul. 223 (1928), pp. 63, figs. 15*).—Using data gathered from 80 cooperative livestock shipping associations, the characteristics, operating methods, business practices, and the benefits and problems of such associations are described. The factors affecting the cost of marketing are discussed, and an analysis is made of the cash marketing costs of the associations marketing in South St. Paul.

The average costs per hundredweight in 1927 were cattle 70.27 cts; hogs, 79.98 cts.; sheep, double-deck cars, 88.19 cts.; sheep, single-deck cars, $1.20; and mixed cars 81.36 cts. Freight constituted from 50 to 55 per cent, selling commissions from 10 to 15 per cent, and all terminal charges, including freight, from 80 to 85 per cent of the total marketing costs. In 1927 cooperative associations returned to members of each dollar of gross sales as follows: Cattle, 89.4 cts., hogs 92.9, sheep 91.9, and mixed shipments 90 cts.

Appendixes include copies of a membership agreement, certificate of incorporation, by-laws, data as to minimum carload weights and safe loading capacities of cars, etc.

Mutual irrigation companies, W. A. HUTCHINS (*U. S. Dept. Agr., Tech. Bul. 82 (1929), pp. 51*).—This bulletin presents the results of an inquiry into the operation of mutual, or cooperative, irrigation companies in the United States. The character and advantages of and the methods of organizing, financing, and operating such companies are described and illustrated.

An appendix includes a brief summary of the statutory provisions regarding corporations of direct concern to mutual irrigation companies; of matters that should be covered by articles of incorporation, by-laws, and rules and regulations of such companies; and of the control commonly exercised by the States in supervising, by the stockholders in the administering of, and by directors, officers, and the superintendent in the management of mutual irrigation companies.

Cooperation in agriculture, H. C. FILLEY (*New York: John Wiley & Sons; London: Chapman & Hall, 1929, pp. XIX+468, figs. 19*).—This book is the development of a set of lessons used in the University of Nebraska and consists chiefly of chapters describing (1) the organization and operation of cooperative associations for the marketing of grain, citrus fruits, raisins and prunes, cotton, tobacco, dairy products, livestock, wool, poultry and eggs, and other products; (2) cooperative buying enterprises; (3) miscellaneous cooperative enterprises; and (4) cooperation in Denmark. The description of the marketing of grain is in considerable detail, marketing in that field being used as a type with which to compare the marketing of other products. Introductory chapters define cooperation and describe the efforts of Robert Owen and the Rochdale pioneers. Other chapters discuss the fundamentals of successful cooperation, membership relations, orderly marketing and sales policies, and the future of the cooperative movement.

An appendix includes the Nebraska cooperative law for associations having capital stock, suggested articles of incorporation and by-laws for a cooperative elevator company, the Nebraska wheat-pool contract, agreements between the California Fruit Growers' Exchange and its district exchanges and between a district exchange and a local association, and the membership agreement used by many Minnesota cooperative egg and poultry producers' associations.

Each chapter is followed by a list of suggested readings.

Children in agriculture, N. P. MCGILL (*U. S. Dept. Labor, Children's Bur. Pub. 187 (1929), pp. V+81, pls. 14, fig. 1*).—This publication summarizes the principal findings of the published reports of investigations of the work of children in agriculture made by the Children's Bureau, U. S. Department of Labor, and by other agencies.

The kinds of work done by children on the principal crops; the hours of work, absence from and retardation in school, and inequality of opportunity for schooling of child workers on home farms; classes of workers, methods of recruiting, housing conditions, conditions of labor, and schooling of children hired in agriculture; and the outlook for children in agriculture are described and statistical tables are given. A section (pp. 47–55) covers the compulsory school attendance laws, child-labor laws of general application and those applying specifically to farm labor, and the regulations applying to labor camps in the several States.

The farmer's standard of living, E. L. KIRKPATRICK (*New York and London: Century Co., 1929, pp. [XV]+299, figs. 7*).—This work is based upon data obtained in scientific investigations of farm family living by the U. S. Department of Agriculture, State universities, State experiment stations, other public and private institutions, and individuals.

Standard of living is defined as "variety, quantity, and quality of the goods used to meet the physical and psychic, both personal and social, needs of the different members composing the family (or group of families, on an average)." Cost of living is accepted as the most satisfactory measure of the standard of living, and is defined as "the value (dollars' worth) of goods used annually and the distribution of this value among the principal groups of goods."

The material is discussed under the headings of interest in farm family living; the standard of living defined; how the standard of living evolves; the prevailing standard of living of farm families; food used by farm families; clothing worn by farm families; home surroundings, housing, and household furnishings; household operation goods and services; health maintenance, life and health insurance; advancement and personal goods, facilities, and services; factors which condition the standard of living; accessibility of goods, facilities, and services to farm families; investments, savings, records of expenditures, and budgets for farm families; and the satisfactions of farming and farm life.

The expansion of rural life, J. M. Williams (*New York: Alfred A. Knopf, 1926, pp. XVI+346, figs. 7*).—This book is the second of a series dealing with the psychological processes of rural development previously noted (E. S. R., 53, p. 692), and continues the analysis from 1874 to the present time. Two periods of the expansion of rural life are distinguished, that from 1874 to 1900 being characterized by the author as the period of maladjustment and individualism, and that from 1900 to the present as the period of readjustment and cooperation.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Effectiveness of vocational education in agriculture, C. E. Myers (*Fed. Bd. Vocat. Ed. Bul. 82, rev. (1928), pp. X+60, figs. 16*).—This is a repetition, after a 5-year period of the study previously noted (E. S. R., 51, p. 693), and brings the data regarding pupils reported out of school as of April, 1922, and those leaving since, up to date as of April, 1927. Thirty-one of the States reporting in 1922 furnished follow-up data, and 43 States furnished data for pupils leaving school since April, 1922.

The data are analyzed under the following headings: The increase in numbers of persons vocationally trained in agriculture, influence of vocational instruction in agriculture upon high-school mortality, occupations followed by former students of vocational agriculture, miscellaneous factors affecting the farming status of former students of vocational agriculture, tendencies in the development of vocational instruction in agriculture, extent to which ex-high-school students who have not studied agriculture engage in farming, and other occupational studies.

Home economics education: Organization and administration, A. S. Baylor et al. (*Fed. Bd. Vocat. Ed. Bul. 28, rev. ed. (1928), pp. V+70*).—A revised edition of a bulletin previously noted (E. S. R., 48, p. 296), in which material modification has been made to conform to improved standards and changes of policy. The general provisions of the Smith-Hughes Act, the special provisions thereof relating to home economics education in all-day schools, part-time schools or classes, and evening schools or classes, and the training of teachers are discussed. Information and suggestions are given to assist the States in the organization and administration of home economics classes under the act.

Laboratory manual of general microbiology, E. B. Fred and S. A. Waksman (*New York and London: McGraw-Hill Book Co., 1928, pp. VIII+145, figs 19*).—A manual designed especially for students "working with soils or with organisms isolated from the soil."

Zoology for high schools, J. F. Calvert and J. H. Cameron (*Toronto: Educational Book Co., 1928, pp. VIII+344, figs. 343*).—A high school textbook authorized by the Minister of Education for Ontario.

FOODS—HUMAN NUTRITION

Nutrition in health and disease, L. F. Cooper, E. M. Barber, and H. S. Mitchell (*Philadelphia and London: J. B. Lippincott Co., 1928, pp. VIII+574, figs. 103*).—This volume has been prepared essentially as a textbook for nurses and as such is arranged to cover two courses—principles of nutrition and cookery and diet in disease. The subject matter for the first course is presented in three parts, dealing, respectively, with principles of nutrition, food selection, and cooking for the sick and convalescent. Each chapter is arranged for a single lesson, those in part 1 to cover 15 1-hour class periods, part 2, ½-hour periods, and part 4 corresponding 1 and ½-hour laboratory periods. The course on diet and disease is given in 14 1-hour lectures. An appendix presents useful tables for dietary calculations, suggestions to teachers, and a list of helpful reference books and journals. As stated in the preface, "this book presents the newer ideas in both the principles of nutrition and the practice of dietetics, based upon the most recent experimentation and study as well as upon the established knowledge of earlier research findings."

Food, health, vitamins, R. H. A. and V. G. Plimmer (*London and New York: Longmans, Green & Co., 1928, 3. ed., rev., pp. VIII+120, pl. 1, figs. 12*).—A revision of the nontechnical handbook, Food and Health (E. S. R., 56, p. 791).

Fundamentals of bio-chemistry in relation to human physiology, T. R. Parsons (*Cambridge, Eng.: W. Heffer & Sons, 1927, 3. ed., rev., pp. XII+308. pl. 1, figs. 22*).—This is the third edition of the volume, the first edition of which has been noted previously (E. S. R., 49, p. 559).

Chemistry and the food industries (*Indus. and Engin. Chem., 20 (1928), No. 12, pp. 1286–1327, figs. 27*).—The papers listed below were presented at a symposium held at the seventy-sixth meeting of the American Chemical Society, Swampscott, Mass., September 10–14, 1928: Chemistry and the Canning Industry, by W. D. Bigelow (pp. 1286–1289); Chemistry and the Beverage Industry, by F. M. Boyles (pp. 1289–1292); Chemistry and the Baking Industry, by C. B. Morison (pp. 1292–1294); Chemistry and the Cocoa and Chocolate Industry, by F. C. Gephart (pp. 1295–1297); Chemistry and the Preserve, or Jam and Jelly Industry, by C. P. Lathrop (pp. 1298–1301); Relation of Chemistry to the Citrus Products Industry, by C. P. Wilson (pp. 1302–1307); Chemistry and the Flavoring Extract Industry, by B. H. Smith (pp. 1307–1309); Chemistry and the Shortening Industry, by M. B. Graff (pp. 1309–1312); Chemistry and the Dairy Industry, by G. E. Holm (pp. 1312–1315); Relation of Chemistry to the Spice Industry, by J. Glassford (pp. 1316, 1317); Chemistry and the Breakfast-Food Industry, by W. S. Hilpert (pp. 1318, 1319); Chemistry and Food Regulation, by P. B. Dunbar (pp. 1320–1322); The Service of Chemistry to the Milling Industry, by C. O. Swanson (pp. 1322–1324); and Research in the Confectionery Industry, by H. S. Paine (pp. 1325–1327).

The relative cost of nutrients in vegetable foods, H. B. Thompson, L. Feely, and E. T. Fillmore (*West. Hosp. and Nurses Rev., 12 (1928), No. 3, pp. 27–29, 52*).—In this investigation of variations in price and approximate weight of the edible material in common vegetables purchased in different markets of Los Angeles, it was found that although the prices for the same product did not vary greatly in different localities there were marked differences in the unit amounts, such as the number of vegetables in a bunch, size, and weight, and also in quality. In celery the lowest and highest weights purchased at the same price were 210 and 530 gm. On the other hand, fresh onions from two different markets purchased on different days at the same price varied in weight by only 0.6 gm. Data are reported in two tables on the comparison of initial weight, market price, and percentage waste in the vegetables arranged in ascending order of cost per 100-gm. portions and on the weights of the edible portion, carbohydrate, calcium, phosphorus, and iron in 5 cts. worth of vegetables at average prices.

A note on quantitative methods of measuring the nutritive value of proteins, H. H. Mitchell (*Biochem. Jour., 22 (1928), No. 5, pp. 1323–1326*).—This paper consists chiefly of a refutation of the criticisms of Kon concerning the author's method of determining the nutritive value of proteins (E. S. R., 59, p. 291), with a discussion of the difference in significance of this method and that of Osborne, Mendel, and Ferry, with which it was compared.

Points to keep in mind when buying and cooking potatoes, I, II, M. H. Given (*Home Econ. and Amer. Food Jour., 6 (1928), Nos. 11, pp. 314–316, 334, figs. 18; 12, pp. 355, 368*).—Among the points included in this nontechnical discussion of potato selection and cooking are tests for determining cooking qualities, classification of well-known varieties of potatoes according to their suitability for different methods of cooking, the causes of mealiness, sogginess, and waxiness in cooked potatoes, and various methods of cooking potatoes.

Milk consumption in eighteen small Alabama communities, C. N. Leach and L. C. Frank (*Pub. Health Rpts. [U. S.], 43 (1928), No. 45, pp. 2955–2957*).—Detailed surveys made in 1926 of the per capita milk consumption of 16 small communities in Alabama are summarized. The total daily per capita consumption by communities varied from 0.66 to 1.44 pints, with an average of 0.95. Averaged by race, the per capita milk consumption in 9 of the towns studied averaged 1.23 pints for the whites and 0.49 pint for the negroes.

Metabolism of undernourished children, VI, VII, (*Amer. Jour. Diseases Children, 36 (1928), Nos. 5, pp. 979–988; 6, pp. 1161–1172*).—Continuing the series previously noted (E. S. R., 60, p. 91), two papers are presented.

VI. *Caloric balance*, C. C. Wang, M. Frank, and M. Kaucher.—The authors have determined the caloric balance of 10 normal and 26 undernourished children, most of whom had served as subjects in previous studies of the series. In all 52 series of determinations were made. The data are reported by groups according to the classification followed throughout the series and also in order of decreasing intake of calories per 24 hours regardless of the degree of underweight. A table is included of the relation of the weight of the feces to the caloric balance. In order to determine the use in the body of the calories absorbed, a comparison was made of the caloric intake per kilogram and the calories utilized in excess of the basal requirements as calculated from the average daily gains in weight.

No differences were found in the power to absorb food materials or in the caloric utilization of normal and underweight children. The percentage of absorption was the same in all groups regardless of the degree of underweight or of the actual caloric intake. The actual caloric utilization varied directly with the caloric intake, the ratio between the two being constant at 1.09. The percentage utilization was entirely independent of the fecal weight or the actual loss of heat either in the feces alone or in the feces and urine combined.

VII. *Effect of high and low protein diets on the nitrogen and caloric balance of undernourished children*, C. C. Wang, J. E. Hawks, and M. Kaucher.—Two series of metabolism experiments were conducted on 8 normal and 9 undernourished children from 4 to 12 years of age, using in the first series a high protein and in the second a relatively low protein diet. The diets were planned to furnish an equal number of calories, with 2 and 4 gm., respectively, of protein per kilogram of body weight. In actual practice, however, the high protein diets furnished from 76.3 to 122.4 calories, with a nitrogen range of from 0.436

to 0.682 gm., and the low protein diets from 51.1 to 97.2 calories, with a nitrogen range from 0.201 to 0.404 gm. per kilogram of body weight.

On both diets the percentage utilization fell within the range reported in the previous study, but was slightly higher on the low protein than on the high protein diet. The caloric losses in all groups, both in the urine and the feces, were higher on the high protein than on the low protein diet. On the high protein the percentage retention of nitrogen was about the same for normal and undernourished children, but on the low protein the retention was higher for the undernourished than the normal children. The nitrogen storage per kilogram of body weight was twice as high for the undernourished children on the high as on the low protein diet. In all groups the gains in weight were much greater on the high protein than on the low protein, this being more marked in the undernourished than in the normal children.

The authors conclude that a high protein diet is especially beneficial for underweight children, and that probably the beneficial effects of the addition of milk to the diet of the undernourished child are due in large part to the increase in the quantity of protein of excellent quality. They recommend a diet containing 4 gm. of protein per kilogram of body weight for undernourished children, and are of the opinion that the diet of all children, normal or underweight, should contain 1 qt. of milk daily, not only on account of the content of calcium and vitamins in the milk, but especially for its protein content.

Lactose metabolism in women, O. WATKINS (*Jour. Biol. Chem., 80 (1928), No. 1, pp. 33–66, fig. 1*).—An extensive series of observations on lactose excretion in normal, pregnant, and lactating women is reported, with results indicating that certain peculiarities in lactose metabolism are associated with sexual activities in women. During the last stages of pregnancy there was found to be a more or less constant excretion of small amounts of lactose. In the few days before delivery there is a sudden and very marked increase in the excretion of lactose, followed after delivery by an immediate drop to a low level, which continues for from 2 to 5 days and is then followed by a sudden rise and marked fluctuations during the first week of lactation, after which normal values are gradually obtained.

The tolerance to ingested lactose of most normal women in the intermenstrual periods was found to be about the same as that of normal men, about 10 gm. daily. Menstruation and pregnancy apparently increased the tolerance for lactose, but during lactation the tolerance was normal. The interpretation of these findings is thought to lie within the field of endocrinology.

Metabolism (*Chinese Jour. Physiol., Rpt. Ser., No. 1 (1928), pp. [6]+195+III, pl. 1, figs. 12*).—The collection of papers listed below represents various experimental and statistical studies conducted under the auspices of a committee appointed in September, 1926, by the China Medical Association and the Chinese Physiological Society to study the basal metabolism of the Chinese. It is noted in the committee report that the data thus far obtained are not sufficient to settle the question as to whether or not there is a racial difference between the basal metabolism of the Chinese and that of westerners, but serve simply as a preliminary report, with suggestions for further work. The individual reports and authors are as follows: Calculation of the Normal Pelidisi Index for the Chinese (pp. 1–12) and Calculation of the Body-Surface Area of Chinese (pp. 13–24), both by P. H. Stevenson; Estimation of the Surface Area of the Chinese, by S. S. Waddell, C. H. Han, and Y. P. Ch'en (pp. 25–31); Basal Metabolism in Anthropology (pp. 33–38) and A Respiration Apparatus for a Metabolic Study of the Various Subdivisions of the Human Race (pp. 39–58) (E. S. R., 59, p. 391), both by F. G. Benedict; Basal Metabolism of Chinese and Westerners, by H. G. Earle (pp. 59–79); Addendum to Professor Earle's Report: Data and

Observations on Several Factors Influencing Basal Metabolism in China, by H. Necheles (pp. 80–92); The Blood Pressure of Chinese in China and in the United States of America (pp. 93–96) and Physical Measurements in Chinese (pp. 107–117), both by C. L. Tung; Pulse Rates and Ratios in Chinese Students, by H. S. D. Garven (pp. 97–105); Normal Variations of Blood Chemical Constituents in Chinese, by S. M. Ling (pp. 119–122); Nitrogenous Metabolism in South China, by S. Y. Wong (pp. 123–127); Diet of Coolies in Changsha, by M. N. Powell (pp. 129–133); Studies of Dietaries in Peking, by H. and D. Y. Wu (pp. 135–152) (E. S. R., 56, p. 793); and Nutritive Value of Chinese Foods (pp. 153–186) (see below) and Heredity, Environment, and Physiological Average (pp. 187–195), both by H. Wu.

Nutritive value of Chinese foods, H. Wu (*Chinese Jour. Physiol., Rpt. Ser., No. 1* (*1928*), *pp. 153–186*).—Included in this report are extensive tables compiled from various sources of the proximate composition and fuel value per 100 gm. and per catty of Chinese animal and vegetable foods and wines; the percentages of calcium, phosphorus, and iron in the edible portion of some Chinese foods; a classified list of vitamin values; and the biological values of the protein of a few of the main articles of diet. In the table of food composition, the scientific and the Chinese names of the food are included.

The basal metabolism of some Australian aborigines, H. S. H. Wardlaw and C. H. Horsley (*Aust. Jour. Expt. Biol. and Med. Sci., 5* (*1928*), *No. 4, pp. 263–272, fig. 1*).—Basal metabolism determinations are reported for 8 full-blooded male Australian aborigines and 1 half-caste. The determinations were made by the open circuit Douglas bag method under the usual precautions for complete rest.

The minimum, maximum, and average values for 7 of the full-blooded subjects were 54.5, 72, and 69.3 per cent of the Aub-Du Bois standards. One of the subjects who had a much greater muscular development and more energy than the others and the half-caste subject had values slightly above these standards. With these two exceptions the data were considerably lower than those reported by Hindmarsh for white Australian subjects (E. S. R., 59, p. 289.) This is thought to indicate racial differences, although it is suggested that the low values obtained may be due in part to the lethargic habits of life of the subjects, their physical development, and the climate.

Feeding experiments with a diet low in tyrosine, H. D. Lightbody and M. B. Kenyon (*Jour. Biol. Chem., 80* (*1928*), *No. 1, pp. 149–153, fig. 1*).—A limited amount of evidence is presented that growth of rats, at least for the experimental period of 12 weeks, is independent of the tyrosine content of the food.

The influence of iodine upon the growth and metabolism of yeasts, J. E. Greaves, C. E. Zobell, and J. D. Greaves (*Jour. Bact., 16* (*1918*), *No. 6, pp. 409–430*).—Iodine in amounts as small as 1 part per million has been shown to accelerate the growth of yeasts in Mayer's nutrient solution prepared from specially purified reagents. A possible relationship of iodine to bios is suggested.

Observations bearing on the determination of vitamin A, E. M. Nelson and D. B. Jones (*Jour. Biol. Chem., 80* (*1928*), *No. 1, pp. 215–226, figs. 2*).—This paper consists chiefly of a criticism of the United States Pharmacopoeia method for the vitamin A assay of cod-liver oil. In the opinion of the authors, the chief defect is the lack of provision of vitamin D which makes the period of depletion of vitamin A irregular and unreliable. If vitamin D is supplied, ophthalmia usually develops before growth ceases, so that when the recommended technique is followed the animal may be in too severe a condition to respond to the low levels of vitamin A recommended. In the authors' experience permanent cure of ophthalmia does not take place unless the level of vitamin A fed is high enough to permit growth of the rat at about its maximum rate.

A comparison of the cure of ophthalmia and the amount of growth as criteria of vitamin A potency is reported, with the conclusion that the latter is more reliable but that observations on the presence and change of severity of ophthalmia are essential.

In applying the pharmacopoeia method to butterfat, results were obtained in agreement with those reported by Sherman and Hessler (E. S. R., 57, p. 203) in that the addition of vitamin D in generous quantities did not affect the rate of growth during the test period. The butter used had about ⅕ the vitamin A potency and less than 1/200 the vitamin D potency of a good grade of cod-liver oil.

A new process for the separation of the vitamin fraction from cod liver oil, J. K. Marcus (*Jour. Biol. Chem., 80 (1928), No. 1, pp. 9–14*).—The process described consists essentially in preparing an alkali soap magma of the oil by limiting the amount of water and alcohol during saponification, extracting the magma with ethylene dichloride, and distilling the extract in vacuo. Two methods of preparing the magma are outlined. One is the cold saponification process involving the saponification of the oil with concentrated aqueous alkali in the presence of a small amount (less than 1 per cent of the amount of cod-liver oil used) of alcohol. Under these conditions a vigorous exothermic action takes place. In the other method the magma is prepared by saponifying the cod-liver oil in homogeneous solution with alcoholic alkali as in the usual manner, distilling off the alcohol, and adding a limited amount of water. The first of the two methods is considered preferable if suitable stirring arrangements are available. The new process is considered to be superior to the old methods of preparing fat-soluble vitamin concentrates on account of the fact that ethylene dichloride is practically noninflammable, forms no explosive products, has a low solubility for water, distills at low temperature in vacuo, and is heavier than the soap solution, making it possible to draw off the active material without exposure to air. The concentrate is said to have the complete vitamin A and D potency of the original oil.

Protein and vitamin B, G. A. Hartwell (*Biochem. Jour., 22 (1928), No. 5, pp. 1212–1220, fig. 1*).—The author has extended her theory of the relationship of protein to vitamin B to a comparison of the relative requirements for vitamin B of different proteins, with the conclusion that edestin requires more yeast extract than either casein or egg albumin for normal metabolism in young growing rats. Marmite autoclaved at 120° C. for from 4½ to 5 hours was equally satisfactory. Inasmuch as in most of the experiments the rats were not kept on raised screens and consequently had access to the antineuritic vitamin in their excreta the results appear inconclusive.

Studies on the action of a diet low in vitamin C on pregnant women, fetuses, and newly born infants [trans. title] (*München. Med. Wchnschr., 75 (1928), No. 49, pp. 2087–2090*).—This paper on the effects of a deficiency but not complete absence of vitamin C during pregnancy consists of three parts. Part 1, by E. Walkhoff, summarizes the pathological findings in an investigation of the effect of a low intake of vitamin C on the course of pregnancy in guinea pigs, including an examination of aborted fetuses and of the young dying soon after birth; part 2, by O. Walkhoff, summarizes the findings in an examination of the teeth of these animals; and part 3, by P. Reyher, reports the autopsy of a stillborn infant whose premature birth is attributed to lack of vitamin C.

From the high percentage of abortions among the guinea pigs on low vitamin C; the poor condition of the teeth of both the mothers and offspring, particularly incomplete dentin formation; and the similarity in findings in the stillborn infant, the authors conclude that an abundance of vitamin C is important during pregnancy.

Irradiated ergosterol: The richest source of vitamin D, E. H. Volwiler (*Clin. Med. and Surg., 36 (1929), No. 1, pp. 28–31*).—This is a brief review of recent literature on the clinical application of irradiated ergosterol.

Antiricketic substances.—VIII, Studies on highly purified ergosterol and its esters, C. E. Bills and E. M. Honeywell (*Jour. Biol. Chem., 80 (1928), No. 1, pp. 15–23*).—Continuing the series of studies previously noted (E. S. R., 58, p. 795), the authors have isolated ergosterol in pure form in two ways, (1) by recrystallization of crude ergosterol from a 3:1 mixture of alcohol and benzene and (2) by saponification of purified ergosteryl isobutyrate. The crude sterol obtained from the unsaponifiable fraction of the fat of common yeast was found to consist of at least three sterols separable with difficulty. One is ergosterol, another is thought to be identical with zymosterol, and a third is a new sterol melting at 240° C. This has been named cerevisterol. The methods of preparing pure ergosterol and of three new ergosteryl esters, isobutyrate, isovalerate, and cinnemate, are described, together with their physical and chemical constants. The spectrographic and physiological properties associated with ergosterol of ordinary purity were also shown by the specially purified ergosterol.

The quantitative study of the photochemical activation of sterols in the cure of rickets, II, S. K. Kon, F. Daniels, and H. Steenbock (*Jour. Amer. Chem. Soc., 50 (1928), No. 9, pp. 2573–2581*).—In the first part of this continuation of the investigation previously noted (E. S. R., 59, p. 495), the disputed question as to whether or not ergosterol is the only precursor of vitamin D was studied by a repetition of the experiments of Bills, Honeywell, and MacNair (E. S. R., 58, p. 795), with confirmation of their findings that twice-brominated cholesterol and cholesterol purified with Norite charcoal and with Merck's animal charcoal show traces of antirachitic properties on irradiation. After more drastic purification by repeated boiling with potassium permanganate the cholesterol could no longer be activated, thus suggesting that the activation previously demonstrated was due to remaining traces of ergosterol.

A study of the photochemical activation of highly purified ergosterol was then undertaken following the procedure described in the previous paper, with improved apparatus and slight modifications in technique. The tests were conducted on two concentrations, $\frac{1}{25}$ per cent and $\frac{1}{250}$ per cent, in optically pure alcohol with monochromatic radiations of 256, 265, 280, and 293$\mu\mu$. The quantity of radiant energy necessary for minimum activation was found to be constant for the various wave lengths, to be independent of the state in which the ergosterol was irradiated (some being irradiated in the dry state), and to be the same for ergosterol acetate as for ergosterol. The quantum efficiency, calculated as in the first study, was found to be somewhat smaller than that previously reported, but the present efficiency, corresponding to an amount of vitamin D equal to 6×10^{-8} gm., is considered the more accurate.

The photochemistry of ergosterol, S. K. Kon (*Nature [London], 122 (1928), No. 3069, pp. 276, 277*).—By exposure to intense monochromatic radiations of a sensitive platinum-tellurium thermopile coated with a layer of solid ergosterol cemented with ether and a second thermopile to measure variations in the intensity of the light source, it was found that the photochemical activation of ergosterol does not involve appreciable absorption of heat. This fact, together with the observation noted above that the quantum efficiency of the photochemical activation of ergosterol by monochromatic light is constant over a wide range of radiation, is thought to indicate that "the quantum efficiency of the formation of vitamin D is low even for monochromatic radiation, most of the energy being dissipated as heat or used to elicit complicated reactions leading to the formation of new products other than vitamin D."

Studies in the sterol group.—I, The absorption spectra of some cholesterol derivatives, I. M. Heilbron, R. A. Morton, and W. A. Sexton (*Jour. Chem. Soc.* [*London*], *1928, Jan., pp. 47–51, fig. 1*).—The spectroscopic examination of several cholesterol derivatives with one, two, and three double bonds has demonstrated that selective absorption occurs only when at least two double bonds are present in a single molecule. Of particular interest is thought to be the reaction with cholestenone This derivative with two double bonds showed absorption at 243 and 312 μμ. The latter band is thought to be the ordinary ketone band, while the former is not only strikingly similar to the well-defined band 247 μμ of vitamin D, but, like it, disappears on irradiation in alcoholic solution (E. S. R., 58, p. 794). Unpublished work indicating that cholesterol changes to cholestenone on dehydrogenation has suggested that a similar change takes place in the formation of vitamin D from ergosterol.

Physiological functions of vitamins, R. R. Williams and W. H. Eddy (*Carnegie Inst. Wash. Yearbook 27* (*1927–28*), *pp. 375–380*).—This is the first progress report of an investigation of the physiological functions of the vitamin B complex undertaken in April, 1927, under a grant from the Carnegie Corporation of New York to the Carnegie Institution of Washington.

The work to date has consisted of an extension of the study of the bioses or yeast stimulants, the results of which have been noted from other sources (E. S. R., 59, p. 109), and of attempts to differentiate vitamin B into the factors of which it is composed. In addition to results previously reported (E. S. R., 60, p. 203), it is stated that some evidence has been secured of the existence of a fourth member of the vitamin B complex. Following the English system of nomenclature this is referred to as B. This substance is thought to be present in brewers' yeast and also in commercial casein after thorough extraction with 60 per cent alcohol and is said to be essential to the growth of rats.

The fractionation method of Jansen and Donath (E. S. R., 57, p. 489) has been repeated with results confirming in some but not all respects those reported by these authors. The B_1 (F) activity as tested on both rats and pigeons was widely scattered in many fractions, but in each case the fractions selected by Jansen and Donath proved to be more active than the discarded ones up to the stage of precipitation with platinic chloride. Here it was found that the precipitate was only partly soluble in water and that the activity was concentrated in the insoluble rather than the soluble fraction. The yield, however, was small. The crystalline substances separated from the final fraction proved to be physiologically inert or nearly so.

Tests of the fractions corresponding to those discarded by Jansen and Donath showed many of them to be active with respect to B_3 as well as B_1. In general, silver nitrate proved to be a much less selective precipitant for B_1 than Jansen and Donath had reported for the rice polish fractionation, nor was it a selective precipitant for B_3. Phosphotungstic acid precipitated B_1 more completely than B_3.

The concentrate obtained from yeast by the method of Kinnersley and Peters (E. S. R., 60, p. 94) appeared to have the properties of B_1 rather than of B_2 or B_3.

Resuming earlier attempts by one of the authors to determine the nature of the antineuritic vitamin by testing various synthetic substances for antineuritic activity (E. S. R., 46, p. 864), a study has been made of the effect of various di-keto piperazines as sources of the antineuritic vitamin for rats. The enol forms of certain of these compounds were found to have a definite effect on growth and the keto forms to be entirely without effect, thus conforming to the earlier theory of isomeric change as a factor in the lability of antineuritic substances. "The chemical features associated with the apparent curative activity of the earlier synthetic preparations are also present in the di-keto piperazines. Feeding results to date with pigeons are not convincingly positive, and those with rats, while apparently beyond the limits of experimental error, still lack the excellence obtainable with natural antineuritics. We seem to be dealing with substances kindred to but not identical with the natural product."

The minimum amount of vitamin D required for a positive antirachitic effect in the "line" test, K. H. Coward (*Biochem. Jour., 22 (1928), No. 5, pp. 1221, 1222*).—A solution of irradiated ergosterol prepared by T. A. Webster under conditions calculated to generate the maximum antirachitic activity for use in the pharmacological laboratories of the Pharmaceutical Society of Great Britain as a standard preparation of vitamin D was tested for antirachitic properties by the method of Steenbock and Black (E. S. R, 54, p. 489), with results indicating that the amount required for positive results in 10 days was 2×10^{-7} gm. On the assumption that rather less than 10 per cent of the irradiated ergosterol consisted of vitamin D, the amount of actual vitamin D contained in 2×10^{-7} gm. of this standard preparation of irradiated ergosterol would be 2×10^{-8} gm., or exactly the same amount as calculated by Fosbinder, Daniels, and Steenbock (E. S. R., 59, p. 495) to be the minimum amount for initiating a cure of rickets.

An investigation of the prenatal factor in the susceptibility of infants to rickets, A. F. Hess and M. Weinstock (*Amer. Jour. Diseases Children, 36 (1928), No. 5, pp. 966–971*).—The hypothesis that variations in predisposition to rickets among infants are due to variability in the prenatal store of antirachitic vitamin was tested by determining the vitamin D content of the livers of a series of stillborn infants and other autopsy material. The livers of premature infants, considered to have the greatest predisposition to rickets, were found to be no lower in vitamin D value than those of infants born at term. The livers of infants dying at the age of a few weeks or months were somewhat higher in vitamin D content than the stillborn, but marked variations were noted. Two out of three livers of adults examined were practically devoid of vitamin D.

Penetration of the skin by ultra-violet rays, L. Hill (*Brit. Jour. Actinother., 3 (1928), No. 8, pp. 147, 148*).—A brief review of recent literature.

Studies on basal and resting metabolism after radiation with ultra-violet light, I–III (*Amer. Jour. Hyg., 8 (1928), No. 6, pp. 1014–1029, figs. 8*).—Three papers are presented.

I. *The effect of ultra-violet radiation on the resting metabolism of birds*, E. Crofts (pp. 1014–1019).—Exposure of canaries to heavy doses of ultra-violet radiation led uniformly to a drop in basal metabolism, followed by a belated rise to higher than normal levels. Daily radiations of lower intensity resulted in a lowering of the metabolism immediately after the exposure, with no subsequent rise.

II. *The effect of ultra-violet radiation on the basal metabolism of human subjects*, E. Crofts (pp. 1020–1023).—Six students at Goucher College served as subjects in this investigation, in which both light and very heavy doses of ultra-violet radiation failed to have any appreciable effect on basal metabolism. The rise in metabolism obtained with birds in the previous study is attributed to the greater intensity of radiation. "It seems conclusively shown that there is no change in metabolic rate in normal human beings with a dose which is within the range employed in therapy."

III. *The effect of ultra-violet radiation on the resting metabolism of normal rabbits*, M. Hardy (pp. 1024–1029).—Exposure of rabbits to ultra-violet radiation in single or successive doses had no effect on their resting metabolism.

Dietary requirements for fertility and lactation, B. Sure (*Arkansas Sta. Bul. 231 (1928), pp. 5–8*).—Brief summaries are given of the various phases of this investigation which have been noted from complete reports (E. S. R., 60, p. 293).

Liver treatment of anemia and other diseases [trans title], F. Schlesinger (*Fortschr. Med., 46 (1928), Nos. 40, pp. 989–992; 41, pp. 1013–1015*).—A review of English, French, and German literature on the subject, with an extensive list of literature references.

Diabetes and the insulin treatment, J. J. R. MacLeod (*Nineteenth Century, 104 (1928), No. 621, pp. 674–682*).—This is a concise account of the relationship of insulin to metabolism, of the steps leading up to the discovery of insulin, and of the use of insulin in the treatment of diabetes and in investigations of problems of metabolism. In conclusion, emphasis is placed on the necessity of dietetic control in the insulin treatment of diabetes and on the importance of a knowledge by the patient of the nature of the metabolic disturbances in diabetes.

MISCELLANEOUS

Fortieth Annual Report [of Arkansas Station], 1928, D. T. Gray et al. (*Arkansas Sta. Bul. 231 (1928), pp. 82, figs. 18*).—This contains the organization list, brief summaries of the chief lines of work of the station, and a financial statement for the fiscal year ended June 30, 1928. The experimental work reported not previously noted is for the most part abstracted elsewhere in this issue.

Report of the Guam Agricultural Experiment Station, 1927, C. W. Edwards et al. (*Guam Sta. Rpt. 1927, pp. [2]+17, figs. 3*).—This contains reports of the director, the assistant in agronomy and horticulture, and the entomologist, and meteorological observations noted on page 802. The experimental work recorded is for the most part abstracted elsewhere in this issue.

The Utah Agricultural Experiment Station, P. V. Cardon (*Utah Sta. Circ. 76 (1929), pp. 4*).—This circular briefly explains the aims and work of the station and notes some of its recent results.

Thirty-eighth Annual Report [of Washington College Station], 1928, E. C. Johnson et al. (*Washington Col. Sta. Bul. 229 (1928), pp. 71*).—This contains the organization list, a report on the work of the station, and a financial statement for the fiscal year ended June 30, 1928. The experimental work reported is for the most part abstracted elsewhere in this issue.

NOTES

Alabama College.—A new building for the extension service is nearing completion, at a cost including equipment of about $100,000. It is a 3-story and basement structure, 124 by 42 ft. in size, and fireproof throughout. Among other features it will contain a conference room, considerable storage space for publications, and a modern kitchen for use in demonstration work.

California University and Station.—Space for the division of plant nutrition is being provided in the new life science building now under construction by the university at a cost of approximately $1,750,000.

An extensive poultry plant has recently been built and equipped at a cost of $80,000. This plant is located on a warm south slope overlooking the university campus at an elevation of 700 ft. above sea level. It consists of a 3-story laboratory building 50 ft. square, a superintendent's cottage, and 40 experimental pens each housing 48 birds, with 10 by 12 ft. house space and with yards 10 by 25 ft. There are also 16 brooder pens each 10 by 14 ft., and 3 trap nest houses 18 by 40 ft. with concreted pens 25 by 45 ft. Ultimately 40 additional experimental pens, 44 brooder pens, and 10 trap nest pens are to be added.

The poultry studies now under way deal with the nutritive requirement, the physiology of reproduction, differences in marketing qualities of newly laid eggs, and genetics.

Kansas Station.—R. W. Getty, in charge of forage crops investigations at the Fort Hays Substation since 1913, resigned April 1 to engage in farming.

Missouri University and Station.—A complete photomicrographic apparatus and a photostat have been installed in the photographic department, which is now equipped for nearly all kinds of photographic work. G. B. Thorne, instructor in agricultural economics, has resigned to accept a position with the U. S. Department of Agriculture.

Cornell University and New York State Station.—A school for the country milk inspectors employed by New York City was held from February 18 to March 1. The course was given twice and occupied a week, of which one day was spent at the station. An intensive schedule of lectures, demonstrations, and discussions was presented.

As a result of studies with 196 lots of cheese, the station has concluded that, contrary to the traditional belief, a higher quality of cheese can be made from milk which has been cooled and pasteurized than from uncooled or raw milk.

A special appropriation recently approved by Governor Roosevelt provides for an extensive campaign by the station against the oriental fruit moth, bud moth, and codling moth.

Ohio State University.—A statue in honor of President Emeritus W. O. Thompson is planned for the campus as the combined memorial of four recent classes. The statue will be executed by Erwin Frey, sculptor in the department of fine arts.

Alfred C. Hottes, professor of floriculture, has resigned to become editor of *Better Homes and Gardens*.

Oregon College.—Clyde Walker has been appointed instructor in agricultural engineering and has entered upon his duties.

Virginia Station.—R. G. Henderson has been appointed assistant plant pathologist, beginning March 20.

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